COAL AGE

A McGRAW-HILL PUBLICATION

JUNE 1958

PRICE $1

BCR Conference Report . . . . p 118

AMC Convention Report . . . . p 124

Stream Pollution:

Acid Drainage Controls Coming . . . . . p 72

Deep Mining:

Truax-Traer's Nos. 7 and 8 Mines . . . . . p 78

Stripping:

Rope Clamps Cut Downtime . . . . . p 88

Car-Loading:

Automatic Car-Loading at Seco . . . . . p 94

Electric Power:

More Economical Power Conversion . . . p 100

Shaft Sinking:

Hanna Developments Reduce Costs . . . p 106

Shop Practice:

Improved Bucket Teeth for Draglines . . . p 114

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This Month in COAL AGE

JUNE 1958

Features This Month:

Editorials ..... p 71
Acid Drainage Controls Coming ..... p 72
How Truax-Traer Built for Efficiency At Nos. 7 and 8 Mines ..... p 78
Better Rope Clamp Cuts Downtime, Boosts Shovel Range ..... p 88
Automatic Car-Loading at South-East Coal ..... p 94
More Economical Power Conversion ..... p 100
Hanna Developments Cut Shaft-Sinking Costs At Ohio and West Virginia Mines ..... p 106
Improved Bucket Teeth Cut Supply Costs ..... p 114
From Research to Sales ..... p 118
AMC Cincinnati Convention Report ..... p 124

Departments This Month:

Coal Commentator p 12 — News Roundup .. p 26
Foremen's Forum p 142 — Operating Ideas .. p 150
Equipment Developments ..... p 154

► Water Handling

Acid Drainage Controls Coming ..... *p 72*

W. A. Raleigh Jr., Associate Editor, Coal Age

The Ohio River Valley Water Sanitation Commission has initiated a drive to introduce acid-drainage controls in the eight-state water shed under its jurisdiction. Behind the drive are aroused public opinion, apparent lack of pollution-control action by coal, and the narrowing scope of valley stream pollution. Some informed observers fear the industry may be stampeded into punitive legislation before satisfactory, well-defined solutions are available. More likely is an orderly movement toward rules and regulations if the industry adopts an aggressive action program now to curb all stream-polluting wastes.

Featured—The narrowing scope of Ohio Valley stream pollution; proposals for an action program; "Pollution Control Tops Nation's Water Agenda."

► Mechanical Mining

How Truax-Traer Built for Efficiency at Nos. 7 and 8 Mines ..... *p 78*

New high-capacity low-vein loaders carry the production load at Truax-Traer's new Nos. 7 and 8 mines in coal 36 to 48 in thick. Development is based on 8-heading mains and five-heading panels, the latter worked advancing on one side and retreating on the other. Workings are columnized and synchronized. With the exception of one semi-experimental continuous-mining section using bridge and chain units, shuttle cars and rope belts feed to new 8-ton mine cars. Tandem locomotives haul the coal to semiautomatic headhouses for each mine. These feed rock to dumps and coal to a rope-and-button conveyor leading down the mountain to a rough-cleaning tipple. Each mine is served by a separate portal placed on a bench at seam level.

Sidelights—Cowbells, automatic trip loading, roof-bolt docks, protected supply loading and special ballast-spreading cars.

► Stripping

Better Rope Clamp Cuts Downtime, Boosts Shovel Range ..... *p. 88*

Every minute of productive time of a 60-yd stripping shovel is worth its weight in gold. To eliminate costly delays and ensuing loss in productive time resulting from 2½-in hoist ropes slipping or failing at the clamps, Hanna engineers in cooperation with manufacturers developed a large split-wedge-type clamp that provides positive gripping. Since the new clamps have been in use, slipping and failures have been eliminated. An added benefit is a 5-ft increase in dumping height.

Practical Notes—How the clamp was developed; how it works.

► Car Loading

Automatic Car-Loading At South-East Coal ..... *p. 94*

Unattended system for loading railroad cars is governed by limit switches and "float" balls for moving cars under loading booms and transferring stream of coal from fully loaded car to next empty. Two car hoists are designed to pull and retard in handling four cars on each of two loading tracks at Seco's Millstone tipple.

(Continued on p 7)

COAL AGE June 1958, Vol. 63, No. 6. Published on the 1st, monthly, with additional issue in Mid-July by McGraw-Hill Publishing Co., Inc. Publication office, Third & Hunting Park Ave., Philadelphia 40, Pa. United States subscription rate for individuals in the field of the publication $3 per year; single copies $1. Second class mailing privileges authorized at Philadelphia, Pa. For additional information see p 11.

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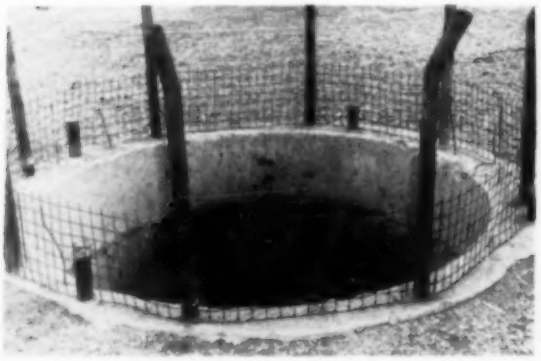
Bonus—Step-by-step description of the operation of the system with layout and schematic wiring diagrams.

► DC Power

More Economical Power Conversion . . . . *p 100*

A new DC substation installation at Barnes and Tucker Co. includes a Hewittic (glass-bulb) rectifier, transformer, switchgear and borehole housed in an insulated Quonset building. Advantages of the installation are minimum cost, simpler maintenance and a measure of portability.

Extra—Photos showing actual installation features.



► Shaft Sinking

Hanna Developments Cut Shaft-Sinking Costs At Ohio and West Virginia Mines . . . . *p 106*

Unusual, safe, practical and economical describe the shaft-sinking technique developed by Hanna Coal. Highlights of the method include employing a vertical overburden drill to outline the shaft and to sink blastholes all the way to the coal. Blastholes are backfilled with sand, which is blown out 9 ft at a time immediately before explosives are loaded to break a 9-ft lift. Men enter the shaft only to prepare a round of shot holes. Heavy inflows of water are sealed off fast and economically with grout to which fast-setting additives are mixed. The net result is a savings over the contract price for sinking a shaft.

Features—Details of drilling, blasting and mucking. How additives cut the cost of grouting. Improvements to overburden drill that permit holes to be sunk 150 ft deep without bits wandering.

► Stripping Services

Improved Bucket Teeth Cut Supply Costs . . . . . *p 114*

Shopmade teeth for dragline buckets, fabricated by

(*Continued on p* 11)

This Month in COAL

LAKES TO THE RESCUE?—Thanks to the opening of the Lake season, though confused and late, bituminous coal was saved from the possibility of drifting down to as low as 6 million tons a week or less in May. First shipments up the Lakes were several weeks late, however, and movement in the early stages was slowed by a buyers' strike engendered by a proposed 30c rail-rate reduction in the Middle West.

There was general agreement that the needs of the docks and other receivers at the Head of the Lakes would be 40 million tons this season, some 7 million off from 1957. In spite of a reduced rate of ore movement, sufficient ship capacity will be available, according to informed sources, to move this tonnage provided a good rate—around 1½ million a week—is maintained. But if the movement is appreciably less for any extended period and an attempt is made to make it up by rail shipments a car shortage could result even though the tonnage for the year is under normal.

STILL NO PICKUP—Even counting in the resumption of Lake shipments, the bituminous coal rate continued to reflect the slowdown in business. The steel rate was still under 55% at the start of June reflecting among other things, the continued lag in auto production. Encouraging signs multiplied but their impact was not sufficient to generate an appreciable upsurge. Most of the betting at the time of this review was for a slow, though slightly improved, third quarter.

190 IN THE FIRST HALF?—If the Lake movement maintains a good rate, bituminous production in the first half could reach 190 million tons. If the Lake tonnage is under what it should be at the end of June, the total will be correspondingly reduced. In comparison, bituminous production in the first half of 1957 was 251 million tons. The previous low for the first 6 mo, incidentally, was 185 million tons in 1954, when the total for the year was 392 million.

ANTHRACITE OFF ONE-FIFTH—Hard coal continued to run 100 to 125 thousand tons per week under the 1957 rate into the month of June, with the prospect of winding up the first half with a total of slightly under 11 million tons, compared to 13½ million tons in 1957 in the same period. Cold weather still remains the big unknown in what may happen for the year.

PRICES HOLD—Though the production rate was down, confronting managers with major problems in both operation and sales, the present depression in coal continued to differ markedly from previous ones in that severe price-cutting is notably absent. There have been some concessions and there will be others, but prices generally are being held firmly. Every indication is that this situation will continue.

NUCLEAR CUT—Though the coal program was faring only moderately well in administration circles and Congress as the year wore on, evidence multiplied that some relief may be forthcoming. The administration for example, turned thumbs down in May on more than one government-built nuclear power plant, and was showing some sympathy for eliminating the transportation tax and providing relief to the railroads.

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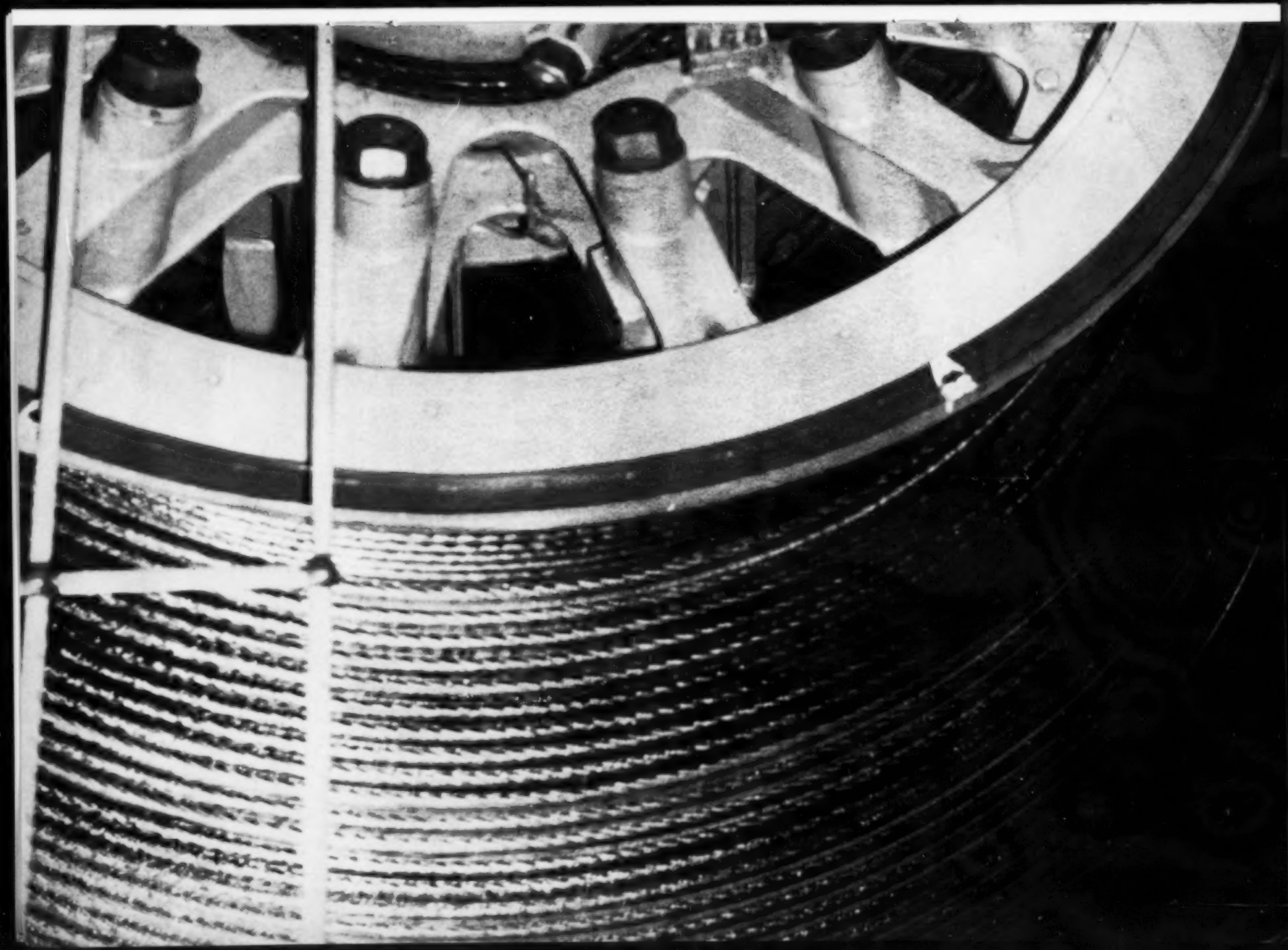

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submerged-arc welding from recently-developed alloy steels, show a total life approximately four times that of teeth previously used. Peabody Coal Co. officials (Northern Illinois mine) report considerable savings as a result of this new approach.

Highlight—Do-it-yourself explanation and photos.

Foremen's Forum ..... *p 142*

The loading-machine operator in your section leads the mining cycle. *Foremen's Forum* this month presents a checklist of the operator's duties, with suggestions to supervisors on how to direct the loading phase for maximum safety and productivity.

Operating Ideas ..... *p 150*

Hydraulic disk brake for personnel carrier; air flow controls substation; plastic pipe holds hot stick; man-trip car is also ambulance.

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COAL AGE, VOLUME 63 — June, 1958, NUMBER 6

COAL AGE, with which are consolidated **The Colliery Engineer** and **Mines and Minerals**, is published monthly on the 1st with an additional Mining Guidebook number in Mid-July by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948) Founder. PUBLICATION OFFICE, Third & Hunting Park Ave., Philadelphia 40, Pa. See box below for directions regarding subscriptions and change of address.

EXECUTIVE EDITORIAL, CIRCULATION AND ADVERTISING OFFICES, 330 West 42d St., New York 36, N. Y. Donald C. McGraw, president; Joseph A. Gerardi, executive vice president; L. Keith Goodrich, vice president and treasurer; John J. Cooke, secretary; Nelson Bond, executive vice president, Publications Division; Ralph B. Smith, vice president and editorial director; Joseph H. Allen, vice president and director of advertising sales; A. R. Venezian, vice president and circulation coordinator.

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COAL AGE articles are indexed by Engineering Index. **Coal Age**'s own index is published annually in the December issue.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Fulfillment Manager, COAL AGE, 330 West 42d St., New York 36, N. Y. Subscribers should notify Fulfillment Manager promptly of any change of address, giving old as well as new address and including postal zone number, if any (official post office request). If possible, enclose an address label from a recent issue of the magazine. Since copies are addressed one to two issues in advance, please allow one month for change to become effective.

This Month in Mining Practice

LESS FROM MORE—Double cutting, paradoxical though it may seem, is yielding appreciable cost and time savings for a growing number of operators. The general plan is based on making a half-cut depth pass first, then returning to sump to the full depth for the final pass. Advantages cited by the users of this system include faster cutting with the same or slightly less total time even though the machine must be brought back to sump the second time; a lower demand and much less wear and tear on the machine; and a good job of dust removal from the cut on the final pass. Point of origin: Enoco Collieries, Inc.

DAM DESIGN—Some recent collapses and washouts have put the spotlight on dams for refuse disposal, clarification and water storage. If the dams are fairly high and are placed in mountain ravines, for example, collapse for any of a number of reasons, including cloudbursts and flash floods, can well endanger both life and property in addition to involving cleanup and reconstruction costs. Because of this hazard such dams should be as carefully designed and constructed as those for any other purpose; and even though they may be deliberately built to permit water to percolate or seep through, they should have the necessary strength to hold against any possible head, and the necessary resistance to prevent any possible washing. And of course, if built over mine workings, cover thickness should be sufficient to prevent a breakthrough.

HEAVY-FUEL ADVANTAGES—Though the idea in not particularly new, the conditions of today are focusing attention on the cost even of fuel for tractors and other diesel equipment. No. 1 diesel oil is a premium fuel. No. 2 furnace oil often will provide equal results in earthmoving equipment. The difference in price usually is around 2c per gallon in most areas of the country. In a 48-hr week a heavy tractor will burn around 275 gal. With a difference of 2c, the saving with No. 2 furnace oil is $5.50 per week. With several units, the saving is a fair number of dollars per year.

FACE LIGHTING—The number of section lighting installations for both conventional and continuous mining continues to grow, though the majority are still experimental in nature. Some of the experimentation is off the beaten track in that attempts are being made to attain equal or greater efficiency with no increase or a lower cost by departing from earlier practice. Hope is held out that such experimentation and further study of the problem will widen the benefits in higher tons per man and greater safety achieved with some of the initial face-lighting installations.

STILL EVOLVING—Recent summaries of field developments indicate further widening of the major benefits already being attained by the use of fertilizer-grade ammonium nitrate and its modifications for overburden blasting. But experience also is showing that for some conditions stronger, denser blasting agents or dynamites may be required, and also that, regardless of the type of agent employed, the recognized pinciples of blasting must be followed.

The Coal Commentator

Last Step

Though it might appear so at first glance, there seldom is such a thing as metal-to-metal contact in machine operation. If there were, the maintenance bill would be much higher.

The answer is that such contact is prevented by a thin film of lubricant derived either from oil or grease. It is the failure of this film for any of a number of reasons that results in mechanical wear and breakdown. Two big causes of failure are poor lubricant quality and improper application. Thus the answer becomes a high-quality lubricant applied in the proper quantity at the proper time.

There is more, however. Contamination can nullify, in a twinkling, the benefits of following all lubrication recommendations. It is all too often neglected in lubrication, whereas it should be a major consideration. **Dispensing from the original container directly to the bearing, with suitable precautions, is the best answer to contamination, though there are others. Sharply reduced maintenance is the reward.**

P-91

Locomotives and aircraft already use the gas turbine for motive power, and the coal industry is looking forward to the prospect of supplying the fuel—perhaps not all but certainly some.

The stake is widening. Experimental turbines have been installed in buses and passenger cars. Now, Allis Chalmers offers the P-91—an experimental crawler tractor powered by a Boeing gas turbine.

It can be accepted that the gas turbine will find wider and wider use as time goes on. It is not quite so certain yet that coal can become a supplier of turbine fuel on a major scale, but the research goes on and there is nothing yet to indicate that it will not culminate successfully.

The prize is no small one. So, as coal men mark the rise of the gas turbine, they can also note that the rewards of a successful coal-firing system will be correspondingly worth while.

Well Deserved

It has frequently been observed on this page that coal-mining progress reflects the joint efforts and contributions of operators and manufacturers. Two awards last month give new point to his conclusion.

First was the presentation of the Horatio Alger award to Raymond E. Salvati, president of Island Creek Coal Co., on May 8. As indicated in more detail in the profile elsewhere in this issue, Mr. Salvati's rise in the coal industry is truly in the Horatio Alger tradition, and his contributions include a long period of service to his alma mater, West Virginia University.

On May 27, George Herman Deike Sr., the founder, with the late John T. Ryan Sr., of the Mine Safety Appliance Co., was honored as the No. 1 Nittany Lion for services to his alma mater, Pennsylvania State University. It goes without saying that M-S-A occupies a unique position in coal as a result of its safety contributions, in the making of which, as in the growth of Penn State, Mr. Deike has played a leading role.

On any basis of scoring, Mr. Salvati and Mr. Deike richly deserve their honors.

Against the Tide

In these depression days, with most of the indicators of activity tending to register lows instead of highs, it is refreshing to learn that declines are not universal. A case in point is the sale of commercial burning units for anthracite.

The first quarter of 1958 brought a spanking 21% increase in purchases of such equipment by owners and operators of dwelling units, institutions and commercial establishments. By the end of the year, the forecast goes, the increase will hit 25%, which is no mean accomplishment these days. Lower cost to the consumer is the major ingredient, backed up by modern convenience through sharply improved automatic burning equipment.

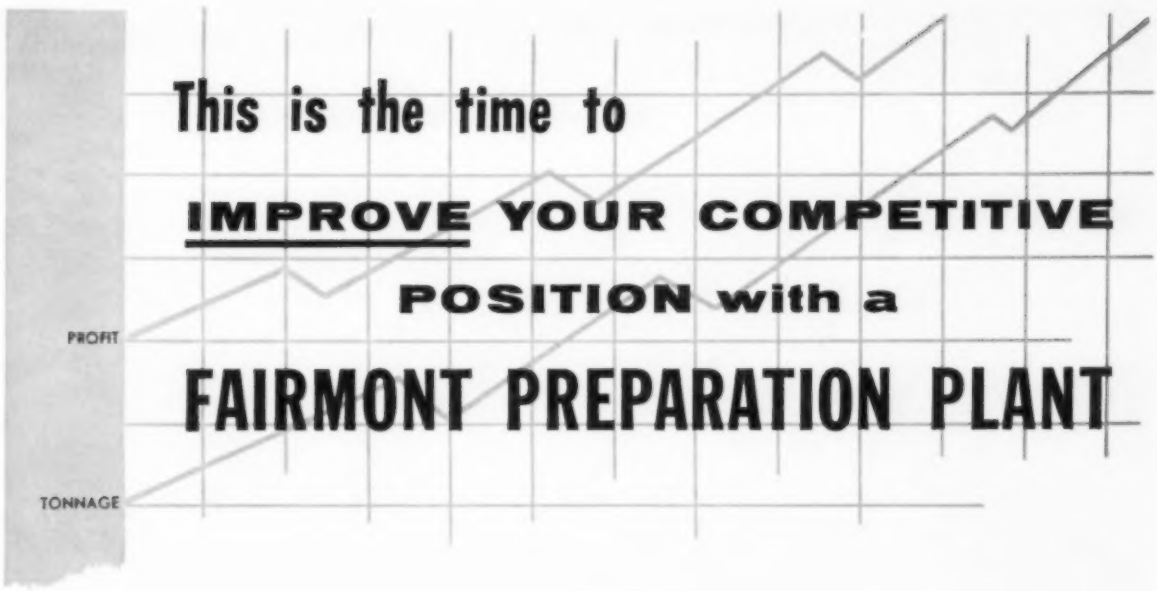
As appreciation of these two key facts becomes more widespread, it can be expected that swimming against the tide will become more and more common until reversal takes place and the tide goes with coal.

Now Pogo

The Hanna Coal News provides your commentator with the idea for this particular dissertation on the uses of ingenuity in coal mining. The April issue includes an item and picture on a roof-bolt recovery wrench with a spring in the leg to adjust the height automatically. Automatically, also, the unit became the pogo stick, and as such is speeding up and easing the work of bolt recovery in all the Hanna mines.

The big machines, of course, bring the big returns in the cost-cutting field, but the gadgets are not to be lightly dismissed. If the benefits of all such devices developed and put into service by coal men were added up, the total would be truly impressive.

As long as such ingenuity flourishes, the coal industry will continue to progress on the cost, quality and safety fronts.



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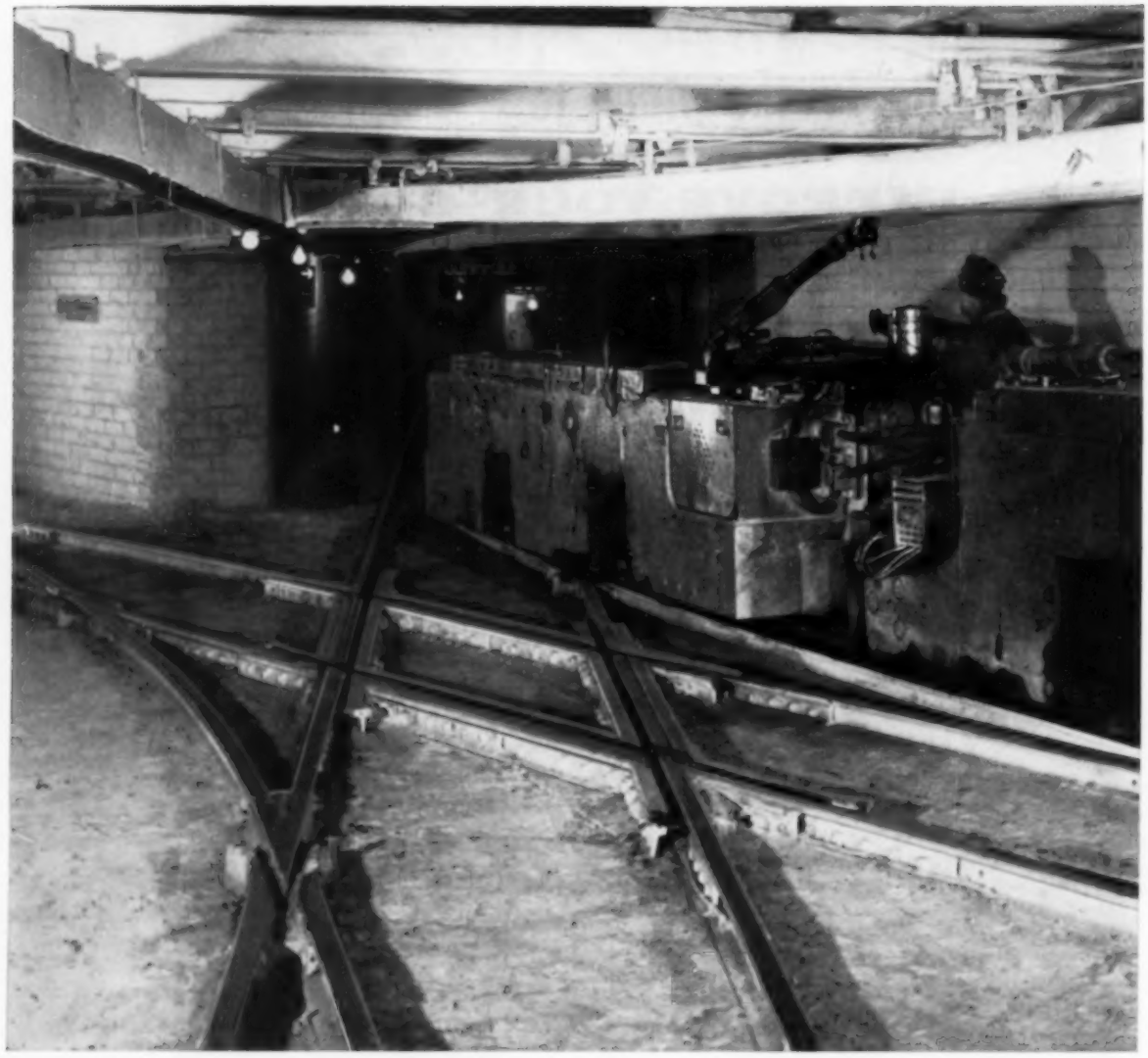

How the "Bethlehem approach" can cut your haulage costs

Some haulage systems are just track; others are professionally designed and skillfully made to fulfill long-range needs. How do you rate your own?

If you feel it leaves something to be desired, we urge you to call in a Bethlehem engineer and let him study your plans. In this session he'll let you do most of the talking, while he absorbs all you tell him about your operations, both present and proposed.

Then he'll return to Bethlehem and go into a huddle with mine-track specialists here. Plans will be drawn up for your approval, after which all rail material will be prepared according to plan, including pre-cutting and curving to radius. All important sections of track work will be completely assembled on our layout floors before shipment is made to you. When your order arrives at the job-site, everything will fit smoothly into place without waste or worry.

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Here's the spray that puts a protective oil film over the coal. Seals out weather. Less dust and segregation of blended sizes in handling. You save in every way—*all the way!* Weatherproof your coal now with Ashland Permatreat coal spray. Our special technical, research and consultant services are yours for the asking. Just write, wire or phone us collect.

One Permatreatment lasts the life of the coal!

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Ashland PERMATREAT

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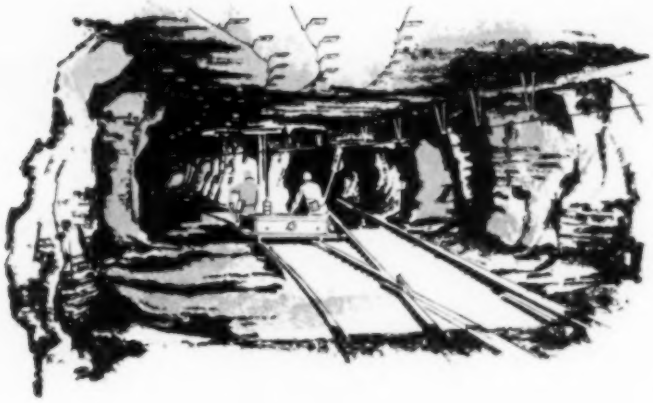


Get instant visual indication of bolt tension with . . .

NEW YOUNGSTOWN VTI

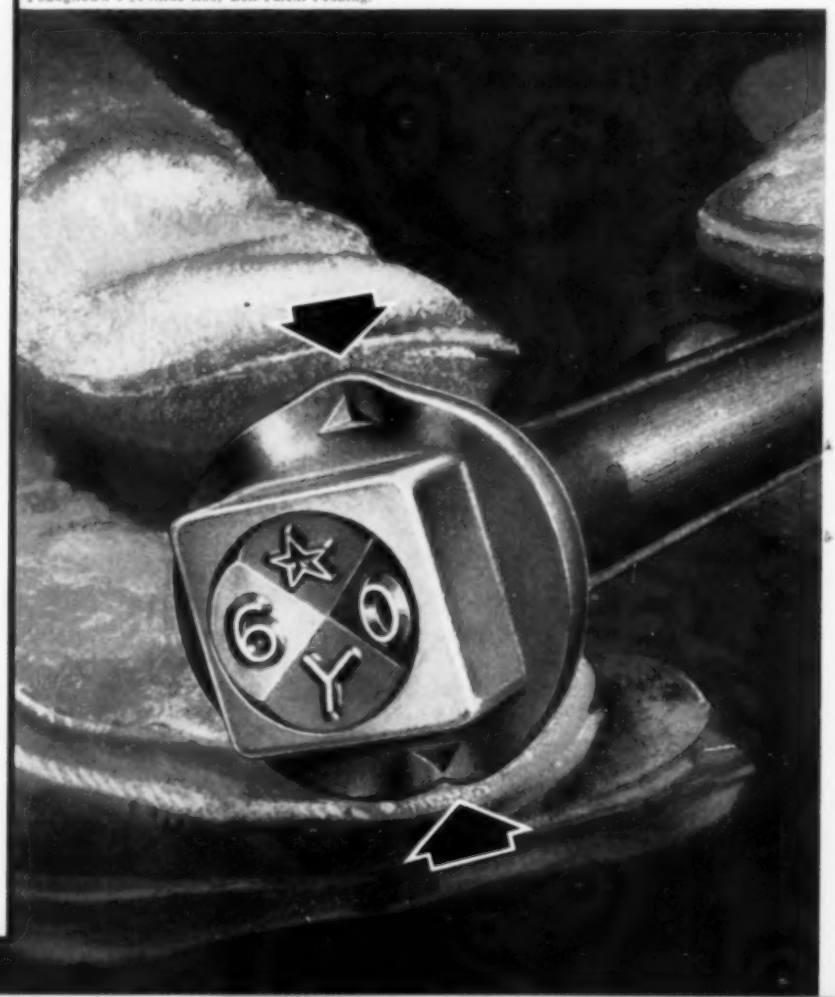
At the Nemacolin Mine of Buckeye Coal Co., Nemacolin, Pa., tests were recently conducted on ¾-inch VTI Roof Bolts by the United States Bureau of Mines. They clearly show how the VTI (Visual Tension Indicating) feature provides a simple, fool-proof and economic means of assuring a predetermined minimum load.

VTI Bolt head showing crimping prior to loading. Air cylinder for tension testing is placed between roof and bolt plate.

Bolt head—loaded to 5,000 pounds—shows crimp beginning to flatten (note gauge reading).

At 6,100 pounds, crimp flattens completely.

Youngstown VTI Mine Roof Bolt Patent Pending.



Youngstown VTI Mine Roof Bolts are available in 2 Standard sizes:

1. High Strength ⅝" diameter Roof Bolting Assembly.

2. Regular Strength, ¾" diameter Roof Bolting Assembly. (#1 and #2 Bolts feature square heads, with integrally forged washers. Their long rolled threads are heavily coated with a rust preventive. Lengths from 28 to 84 inches. Mine Roof Plates—of Dish-Embossed, Bell and Utility types—are furnished with ¾, ⅞ and 1⅛-inch centrally punched holes.)

All Youngstown Mine Roof Bolts are available with either standard or VTI heads.

MINE ROOF BOLTS

Check These Advantages of Youngstown's New VTI (*Visual Tension Indicating*) **Bolt Heads**

When VTI crimps flatten, tension is 5,500 pounds to 6,500 pounds. It provides a definite visual indication that the bolter has tightened the bolt and that its anchorage is strong enough to support the required tension.

If VTI bolt crimps have not flattened, the bolt has not been tightened to required tension. This may be due to:

1. *Carelessness of bolters*
2. *Equipment out of order*
3. *Insufficient anchorage*
4. *Hole diameter too large*
5. *Defective anchorage material*
6. *Improper use of equipment*
7. *Inexperienced bolting crew*

Make sure you have a check on all these by using Youngstown VTI Bolts.

Youngstown VTI Mine Roof Bolts are available with ⅝ and ¾-inch diameters in a wide range of workable lengths.

You'll find one to fit any roof condition encountered in today's high-production mines.

Physical properties of all Youngstown VTI Roof Bolts easily meet or exceed Specification ASTMA-306 as outlined by the Committee on Roof Action.

Take advantage of the highest standards of *quality*—the personal touch in our metallurgical *service* by specifying Youngstown VTI Mine Roof Bolts for your next roof-support job. For additional information, call or write today to our Home Office at Youngstown 1, Ohio.

QUALITY YOUNGSTOWN SERVICE

THE
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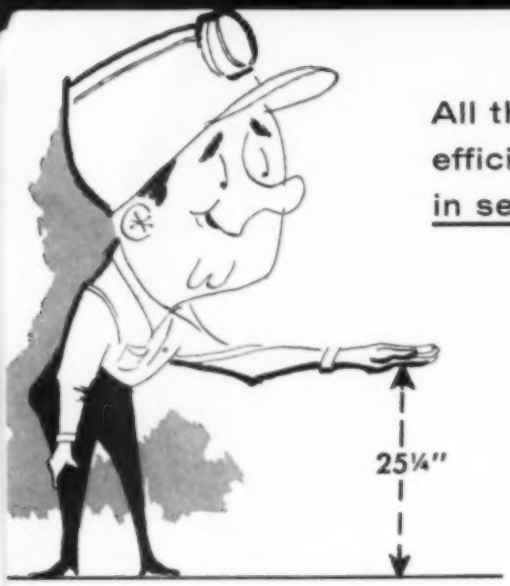
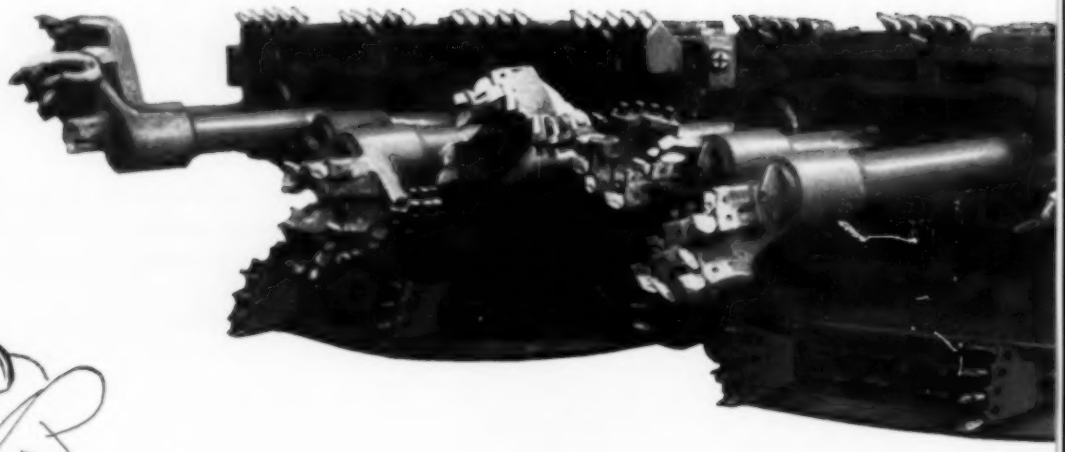
SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel
Youngstown, Ohio



All the benefits of fast,
efficient, continuous mining...
in seams as low as 28 inches

JEFFREY



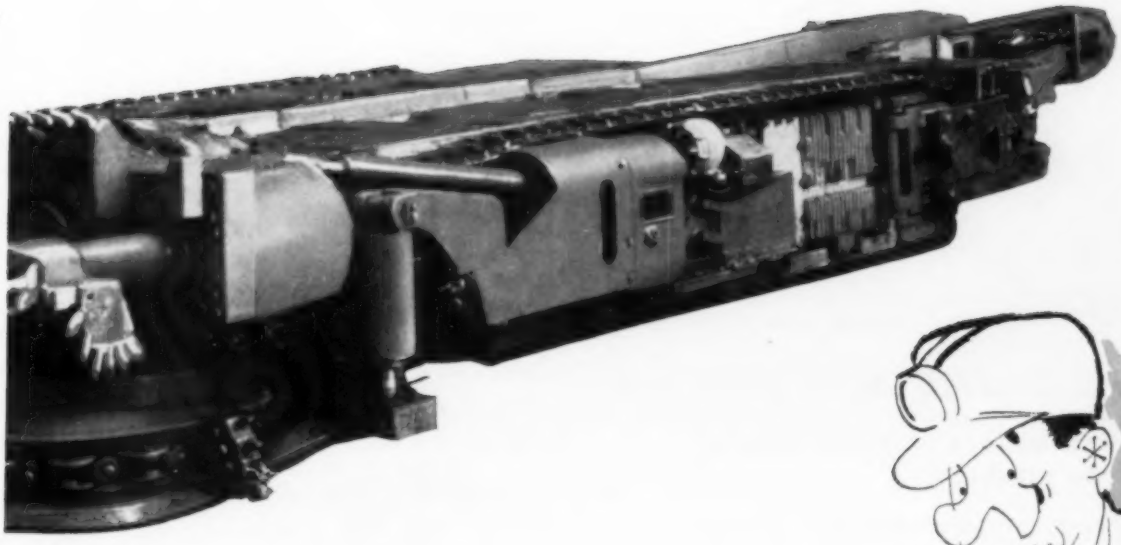
Makes a cut 14' 7" wide

ALL THE time-saving and cost-saving advantages are built into this continuous mining machine. The Jeffrey 86-A Colmol is only 25¼-inches high . . . mines seams as low as 28 inches . . . makes a cut 14-feet 7-inches wide . . . gives good cleanup and smooth bottom.

Specially designed cutting and gathering chain carries coal to the center of the "Colmol", then up and onto the swinging discharge conveyor. It smooths off the cusps, even when the breaker-arm head is raised 8 inches for maximum adjustment of mining height.

This powerful, compact Colmol advances with minimum maneuvering. Coal is broken from the face . . . not ripped

86-A COLMOL



or ground off. You get good overall screen consist, greater speed and efficiency. Colmol withstands the most severe mining conditions, operates with little noise or vibration.

All adjustments are hydraulic, can be made instantly and accurately. Easily accessible parts simplify adjustment and servicing. Safety features provide extra protection for both personnel and machine.

For low seams... or seams up to 8 feet high— efficient, easy-going Jeffrey Colmols step up your production rate, cut operating and maintenance costs. Write for full details. The Jeffrey Manufacturing Company, 912 North Fourth Street, Columbus 16, Ohio.

Low maintenance

MINING • CONVEYING • PROCESSING EQUIPMENT...
TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

JEFFREY

How a Special Page Automatic Dragline

HERE'S THE RECORD

- **7263 HOURS ACTUAL OPERATION TO DATE**
- **TYPE OF MATERIAL – ROCK AND SHALE**
- **ESTIMATED YARDAGE – 215,000 YARDS OVERBURDEN PER MONTH**
- **ACTUAL MAINTENANCE – 2 CORNER WEARING SHOES AND TOOTH POINTS**
- **CONDITION OF BUCKET – EXCELLENT**

In designing a Special AUTOMATIC Dragline Bucket for DeLauter Coal Company's operation, Page engineers had to consider specific problems.

THE PROBLEM	THE SOLUTION
1. Digging Rock And Shale	Extra wide lip and basket design was used to insure faster loading of rock and shale. Tapered sides and back further increased loading efficiency and dumping speed.
2. Reduce Loading Time, Maintain Clean Highwall	Balance of the bucket was calculated to concentrate total weight on tooth points and insure fastest possible loading speed. Special five-tooth lip design used to obtain fast penetration. Corner teeth positioned to cut clean, sharp highwall.
3. Combat Excessive Wear and Abrasion	After extensive research, Page engineers selected USS "T-1" Steel for the DeLauter bucket. Though more costly than ordinary steels, "T-1", with its unusual strength and wearing quality, promised added life and reduced maintenance cost to the user. ***This is the first dragline bucket manufactured from USS "T-1" Steel.***

Bucket Pays Off for DeLauter Coal Co.

7 CUBIC YARD PAGE AUTOMATIC BUCKET MADE OF USS "T-1" STEEL WORKS 7263 HOURS WITHOUT COMING OFF MACHINE . . . SHOWS NO APPRECIABLE WEAR.

"I think the big reason our operators like the Page AUTOMATIC is that wherever they put the bucket down, it starts to dig. They don't have to jockey or position the bucket to take out a certain section. The AUTOMATIC fills fast in one or two lengths and they can make a fast cycle. Personally, I've never in my life seen any bucket stand up and take it like this one. We've given it rough treatment for over a year, and you can see that it is still in excellent shape. Our repair and maintenance costs don't amount to a hill of beans . . . and incidentally that new Page Double Wedge Load Socket makes cable changes a cinch. It takes just a few seconds to knock back the sliding wedge and release the cable. Saves us work and downtime."

Jim Brown, Supt. DeLauter Coal Company.

Jim Brown, DeLauter Coal Company superintendent, and the Page 7 cubic yard AUTOMATIC Bucket after a year's operation.

Driving the sliding wedge back, releases pressure on the cable, permitting main wedge to be lifted out for cable replacement.

Write For Catalog B57

Page

Automatic Dragline Buckets
Walking Draglines

If it's a PAGE... *It* DIGS

PAGE ENGINEERING COMPANY
CLEARING POST OFFICE
CHICAGO 38, ILLINOIS

MORE TONNAGE PER UNIT

Because it's built to protect parts against dirt, dust, water, high bearing loads, and extremes of temperature, Sun 740A-EP helps you run a machine longer before you have to shut it down for maintenance. Hence, Sun 740A-EP helps you mine more coal.

Photo courtesy of Joy Manufacturing Company

SUN'S NEW 740A-EP GREASE HELPS YOU GET MORE TONNAGE

Sun's New Prestige® 740A-EP Grease is an all-purpose, semi-fluid, mine-machine lubricant. It pours readily, even at the lowest operating temperatures, and does not thin out excessively up to 200 F. It is water- and heat-resistant, has extreme-pressure properties, and gives excellent rust and corrosion protection.

When you use 740A-EP you . . .

- **mine more coal,** because you can run longer without shutdowns for inspection and maintenance.
- **cut operating costs,** because parts last longer.
- **simplify lubrication,** because you can use 740A-EP in place of two or three specialized lubricants.
- **use less grease,** because 740A-EP stays put.
- **increase safety,** because you get no excessive drippage. There's no need to worry about fire hazards and dangerous footing caused by gear oil slicks.

These days, when *every* miner is looking for ways to boost tonnage, but *not* his costs, a product like 740A-EP is especially interesting. Want to know the rest of the story? Call in your Sun man, or write to Dept. CA-6.

SUNOCO®

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In Canada: Sun Oil Company Limited, Toronto and Montreal.

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NEW...FROM JOY LOW SEAM

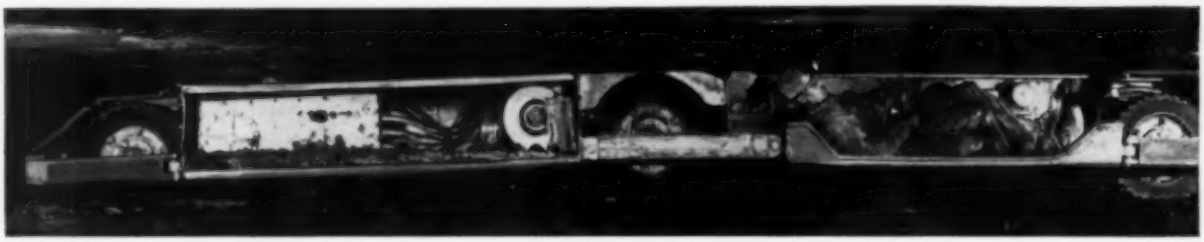
SIX WHEEL JOY 18-SC SHUTTLE CAR HAULS TWICE THE PAYLOAD . . . ONLY 27″ HIGH

You can cut low seam haulage costs in *half* and speed up your entire operation with this completely new shuttle car. The reason for the 18-SC's greater capacity is its unique six-wheeled design. Joy engineers *added* another wheel to each side of the car, reduced the size of all wheel units, and hinged the car in the middle. The result is an extra-large conveyor, 6 feet wide and 27 feet long that empties 4½ tons in 27 seconds.

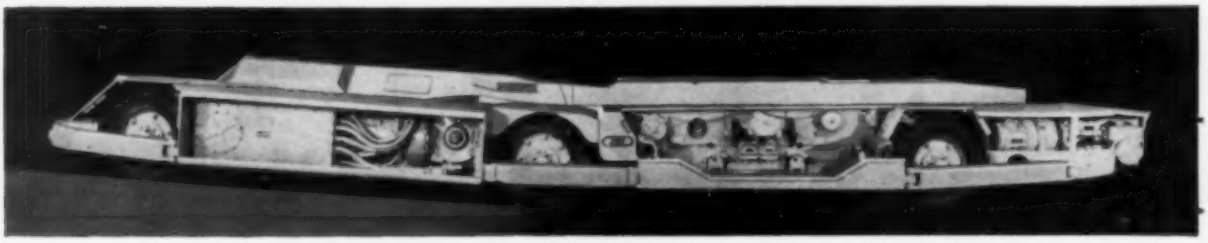
DRIVE WHEELS IN MIDDLE OF CAR—The two center wheels are used for the traction drive. Each wheel is driven independently by a 10 HP motor through a reducer and chain and sprocket, thus eliminating transmissions, torque converters and differentials.

FOUR WHEEL STEERING—The two wheels at both ends of the car are steered hydraulically by twin boosters on each side of the car, and are controlled from the centrally located operator's station. The 18-SC has an inside turning radius of 11 feet.

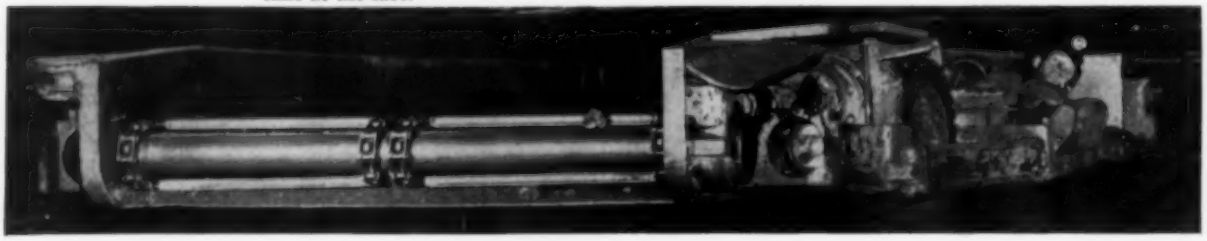
ELIMINATION OF EXPENSIVE WHEEL UNITS—Since each of the six wheels is used *only* for steering or *only* for traction, the wheel units are extremely simple . . . easy and inexpensive to maintain.



BENDS UP-AND-DOWN IN THE MIDDLE—For maximum flexibility under all conditions, the 18-SC is hinged across the width of the car, near the traction wheels. When climbing up and down small rises and depressions the car actually bends in the middle, keeping the wheels in contact with the ground at all times. This hinged design also permits running the discharge end of the car up a ramp when an elevated discharge is desired.



STRAIGHT THROUGH CONVEYOR—This view shows the wide conveyor and clean lines inside the car. The complete absence of wheel wells means more payload, fewer trips, and more time at the face.

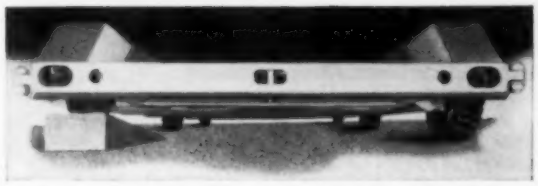


CAR HAULS 4½ TONS

Patent applied for

UNIQUE SUSPENSION . . . NO AXLES . . . WHEELS HUG ROUGH BOTTOM—The four wheels used for steering are individually pivot-mounted to permit two wheels at one end to assume different elevations while the car bed remains level. This suspension, combined with the articulated mid-section, makes the 18-SC completely flexible throughout its length and width. The unique wheel mounting also provides maximum ground clearance, since there is no axle running under the car. The result is a low seam car that travels the roughest bottom quickly and easily with maximum traction and ease of control.

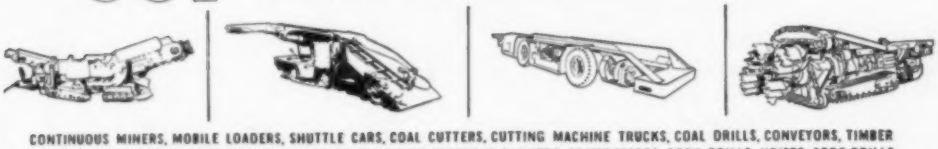
SIMPLICITY OF DESIGN—Because of its direct-drive and unique wheel suspension, the 18-SC is mechanically simple. And all motors and operating mechanisms are mounted *outside* the frame for easy inspection and maintenance.



Front view of the 18-SC shows how wheel suspension works; note that when one wheel runs up over an obstruction the conveyor remains level. Notice also the clean, straight-through lines inside the car.

Other models of this new shuttle car are available for work in higher seams. Talk to a Joy engineer about putting this high-tonnage shuttle car to work in your low-seam operations. **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

JOY . . . EQUIPMENT FOR MINING



AC

All Joy coal mining equipment, including the new 18-SC, is available with AC or DC.

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CONTINUOUS MINERS, MOBILE LOADERS, SHUTTLE CARS, COAL CUTTERS, CUTTING MACHINE TRUCKS, COAL DRILLS, CONVEYORS, TIMBER SETTERS, SHUTTLE CAR ELEVATORS, BELT FEEDERS, FANS, BITS, PORTABLE BLOWERS, COMPRESSORS ROCK DRILLS, HOISTS, CORE DRILLS

News Roundup

Recession Curve: How Flat Is Flat?

Signs that the recession is leveling out encourage coal producers, but most feel recovery will be slow. Producers of metallurgical and export coals record setbacks in first-quarter sales. Utility market continues strong.

NOBODY REALLY KNOWS for sure how a recession gets started, and despite all the expert economic theories, nobody really knows when it's going to end. You might say that it is caused by a buyers' strike, or it may originate with the manufacturers. Along this line, one writer tells the story of the old man who had a hotdog stand doing a thriving business. But the old man couldn't read, and when his son came home from college he said to the old man, "Pop, don't you know there's a depression on?" The old man looked astounded, "Is that so?" he asked. Then he rushed out, took down his signs and didn't sell hotdogs any more. "Yes," he said to his son a few days later, "there certainly is a great depression on."

A Dilemma—This may not be a realistic way of looking at the recession, but it serves to demonstrate the easily upset, uncertain nature of business today. President Eisenhower has repeatedly assured industry in the last few months that all signs point to a pickup in business. But the President is in a hole, say some experts. He is afraid that a tax cut coupled with increased government spending and public work projects would just stimulate another "boom-and-bust" cycle. He is aware that economists call this an "adjustment period" and believes that it might be healthier to let things work out by themselves.

Weakens Nation—To let things work themselves out, however, necessitates letting stockpiles of raw materials dwindle until the low levels require producers to call for a pickup. Such a situation would weaken the strength of the nation during this most critical stage in the cold war, and to consider the idea has been called deplorable by some senators. What's more, say proponents of government aid, there is no way of being certain that the "self-adjustment" won't work its way right down into a depression. For this reason, many experts are betting on a tax cut.

Combination—Some economists speak about a combination of self-adjustment and government aid. They say the process of recovery is already underway. Stockpiles, they note, have already reached the minimum point for mobilization and producers of materials cannot continue to supply manufacturers at the present stockpile level. This, for example, seems to be true of steel which is showing some life, but steel producers are unwilling to step up production as long as the car market is doubtful. The economists who hold with the combination theory go on to say that there must now be a rise in production, but without greatly increased employment because manufacturers will want to keep costs low. The theory is that unemployment may stay at 4 million until the end of 1959. During 1959, the government will probably lend a hand with increased spending until manufacturing hits a new peak . . . this possibly by the start of 1960.

Coal Production—First quarter earnings of some coal companies are out, indicating the generally depressed level of coal production. There is some feeling that if things don't get rolling, production for the year may be lower than 400 million tons. Island Creek Coal Co., which netted $1,191,587 for the first three months as against $2,770,670 for the corresponding quarter in 1957, typifies a wide part of the coal industry. "The metallurgical market for our coals during the first quarter was severely depressed due to the low operating rate of the steel industry. Coincidentally, the export demand also deteriorated and thereby deprived us of any alternate market for our high-quality metallurgical coals."

Some Exceptions—While the cyclical steel industry has knocked coal production down, the electric utility market, which is somewhat "recession proof," has continued at almost the same level as before the turnabout in business. Peabody Coal Co., which has 70% of its coal going to the utility market, showed a net of $2,913,054 for the first quarter as against $2,561,251 for 1957. *Keystone Coal Buyers' Manual*, a *Coal Age* affiliate, reports that the trend towards conversion of energy from coal, oil and gas into electricity has shown a 40% increase in the 10-yr period, 1946 to 1956. Measured as a percent of total energy use, it is stated, the

In This Section

People in Coal	p	32
Coal Abroad	p	46
Current Coal Patents	p	39
Preparation Facilities	p	62
New Books	p	58
Mines and Companies	p	50
Utilization	p	54
Transportation	p	58
Accidents	p	58
Equipment Approvals	p	64

How to get longer service life with

Whyte Strand Mining Ropes

You can lengthen the service life — and lower the yearly cost—of your wire ropes by using the *correct* Whyte Strand Wire Rope for each application.

What do we mean by correct? Well — all wire rope isn't alike. The demands of dragline service are different from those on haulage ways or shaft hoisting. And there's a Whyte Strand rope specially designed to withstand the particular abuses of *each* kind of mining service. What's more, we'll be more than glad to work with you in finding which of Macwhyte's thousand-and-one ropes is the *best* for *your* kind of job.

All Macwhyte ropes are Internally Lubricated, by a special process which individually coats every wire . . . every strand . . . with a tough, tenacious lubricant coating. This increases the rope's flexibility, reduces internal wear, and provides excellent corrosion resistance. Result: Longer service life with Whyte Strand Mining Rope.

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Write for industry's authoritative booklet on wire rope and its uses. Ask for Catalog G-16 — the Blue Book of Wire Rope!

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MACWHYTE WIRE ROPE COMPANY, 2931 **Fourteenth Avenue, Kenosha, Wisconsin**
Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel, Plastic Coated and Nylon Coated Wire Rope, and Wire Rope Assemblies. Special catalogs available.

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1946 figure was 12.8%. This figure gained steadily year by year and showed 17.9% in 1956.

Steel the Key—The steel industry shows signs of picking up, but at one point sank as low as 47.1% of capacity. Can it pick up to 75% by the end of the year is the question, and right now it looks doubtful. Some car men say that if you look around you, you won't see many cars less than four or five years old on the road. Because past statistical records show that most people buy a new car after an average of 5 to 6 yr of use on the old one, these automobile men are depending on the lower bank credit rates and consumer need to boost car sales. General Motors and Chrysler, they say, are by no means out of business. Coal will move up with steel and autos.

Atom Plan Gets Cold Shoulder

Propose funds for research and development be cut sharply.

The Administration has refused to allow construction of more than one atomic power plant. This decision comes as a great disappointment to Democrats on the Joint Congressional Committee on Atomic Energy, who have been pressing for several plants.

Plants Out—Funds proposed by the Administration total $193,379,000. This sum is well below what the Committee had requested and comes mostly by way of drastically cut research money. Eliminated were a $125,000,000 plutonium-producing reactor and a $60,000,000 natural uranium-fueled, heavy-water, moderated reactor. These plants had been key projects in an informal agreement reportedly come to between the Atom Committee and the Government Budget Bureau. Funds for extensive research and development on atomic fuels were also knocked down.

Still Cool—Actually, the only major project left intact by the Administration plan is construction of a gas-cooled reactor using slightly enriched uranium as fuel. Even with this one plant, many Government officials refuse to consider outright government construction without the participation of private industry.

Old View—This latter view is in accordance with the Administration's long held stand that primary responsibility for large-scale atomic power plants rests with private industry. Democrats argue that the high cost and risky state of atomic-power development require the Government to take the lead if goals at home and abroad are to be realized.

A GENERAL ELECTRIC ENGINEER checks a diesel-electric locomotive system at a newly-established shop in North Bergen, N. J. This shop is one of 48 GE repair centers which have been established around the country for major overhaul of industrial locomotives. With this network of repair stations, industrial locomotives weighing up to 120 tons can receive overhauling much like the family car. Service ranges from emergency field work only, by some of the smaller shops, to complete overhaul and rebuilding at the major centers. The 11 major centers are in New York, Pittsburgh, Cleveland, Dallas, San Francisco, Atlanta, Salt Lake City, Boston, Chicago, Minneapolis and Portland, Oregon. Ranging up to 120 tons and about 1,000 hp, industrial locomotives are used for shunting materials to a factory site, for short-line railroad hauling and in mine work. The major repair centers, it is noted, will be able to completely overhaul a locomotive in four to six weeks—doubling its useful life—at a cost 20 to 40% that of a new locomotive of like size and horsepower.

Stormclouds Gather

Additional law suits filed against the Glen-Alden merger with List Industries put a crimp in the plans of the two companies.

Observers call the Glen Alden-List Industries merger a "mouse eat cat" proposition. But from the looks of things now, the mouse may have to nibble on cheese for some time yet. Four law suits now stand in the way of the proposed merger and the possibility of more Glen Alden stockholders filing suits is not remote.

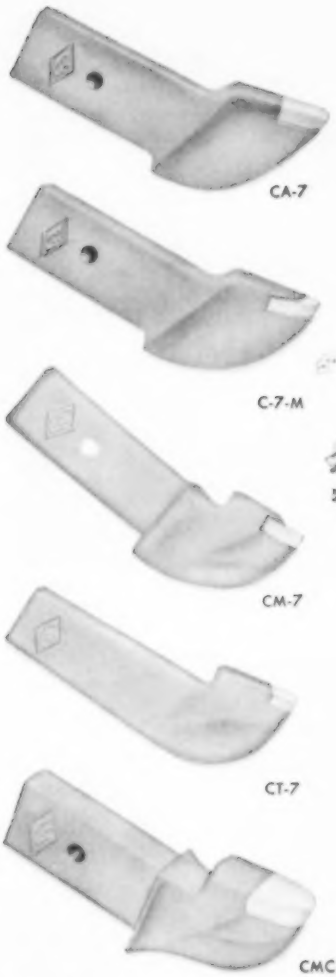
Stockholders Say—The general legal complaint is that the proposed merger was conceived by Albert A. List, president of List Industries, at the expense of Glen Alden stockholders. If the merger goes through, the List family would control 37.2% of the stock of the new List-Alden company, it is alleged. List shareholders would control 76.5% of the stock in the new firm and Glen Alden stockholders only 23.5%.

In mid-May, court rulings restrained Glen Alden from carrying out the reorganization agreement with List Industries, and Glen Alden promptly filed an appeal with the Pennsylvania Supreme Court. Arguments before the high court were scheduled for June 2. At the same time the New York State Supreme Court granted a temporary injunction against the reorganization to Samuel Gilbert, Brooklyn, a Glen Alden stockholder. The court case at Wilkes-Barre boiled down to the main issue of whether the Glen Alden-List move was a merger or a purchase.

Getting Results

Scientists at Island Creek produce stoker coke with a new system . . . took two years.

Island Creek Coal Co. hustled its first batch of a new-type stoker coke into railroad cars recently. What's so different about this coke? Well, it isn't the coke actually, but the process used to make it . . . a system that coordinates continuous production of coke with steam generation. The company produced the first three carloads on a test basis in cooperation with the P&LE R.R., and shipped the coke to a chemical plant



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Blue-Bit
MINING TOOLS

Wide Tool Selection for use on...

JEFFREY

COLMOLS

for every mining condition

For all Jeffrey Colmols, including the new 86A low Continuous Mining Machine, there are Firthite Blue Bit Mining Tools available for bore arm, kerf and base chain positions in grades to suit every mining condition.

Many operators have "standardized" on famous Blue Bits to achieve the maximum efficiency possible from their automatic mining machines.

To help you select the *exactly* right tools and corresponding holders for the conditions in your field, refer to the handy condensed table at the right. If in doubt or when special conditions prevail, a Firth Sterling mining tool engineer will be glad to discuss the problem and recommend a solution.

Position	Recommended Tool Number	Holder	Cutting Conditions	Coal
Bore Arms	CA-7 C-7-M	½ x 1	Light to Med.	Relatively Clean
	CM-7	½ x 1	Med. to Hvy.	Occasional Impurities
	CT-7	Tapered		
	CMC	½ x 1	Heavy	Large Quantities Clay—Sulphur Rock, etc.
Kerf	C-7-M	1 x 1	Average	Average
Base	CM-7	½ x 1	Med. to Hvy.	Av. Bottom
Chain	CMC	½ x 1	Heavy	Rock Bottom Clay Rolls, etc.

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DUNLAP WELDING & SUPPLY—Zanesville
MOLE-BITS COMPANY—Johnstown
U. S. STEEL SUPPLY DIVISION—Pittsburgh
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High Speed Steels
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Chromium Carbides
High Temperature Cermets
Zirconium

PETER MONTALI (left), and Lewis Shrek (right), Bowman Coal Co., receive banner from Inspector C. B. Lozaw.

HARRY O'BRIEN (left), and Martin Lamb (right), receive safety award from S. L. Stiles, federal mine inspector.

Safety Meeting

The Kiski Valley Safety Council held its annual meeting on May 10 at Vandergrift, Pa. Two-hundred thirty-six people attended the affair at which the principal speakers were Jerome O. Maher, president, Leechburg Mining Co., and Harry H. Brainerd, executive manager, Western Pennsylvania Safety Council. Winners of safety banners were Bowman No. 2 mine of the Bowman Coal Co. and Dorg No. 2 mine of the Dorg Mining Co. The meeting, it is noted is a collective attempt at all levels of mining to make everyone safety-conscious. Present were representatives of: Pennsylvania Dept. of Mines; Old Republic Insurance Co.; U. M. W. of America; U. S. Bureau of Mines, and Western Pennsylvania Safety Council, all sponsors of the safety competition.

W. DAN WALKER (left), district supervisor, USBM, and James O. Maher, president, Leechburg Mining Co., spoke to Kiski Valley Safety Council.

for use in making calcium carbide.

Air Control—Island Creek scientists fed their Scarlet Flame, low-ash coking coal into a traveling-grate stoker operating at double its normal speed. By precisely controlling the amount of air entering the stoker, the scientists are able to burn off the volatile matter in the coal. All the while two results are being achieved:

1. The stoker produces heat for coking and steam.

2. Fixed carbon in the form of small-sized, porous, high-temperature coke is recovered.

When exceptionally low-ash coal is used, reports the company, the resultant coke is well suited for electro-chemical and electro-metallurgical processes.

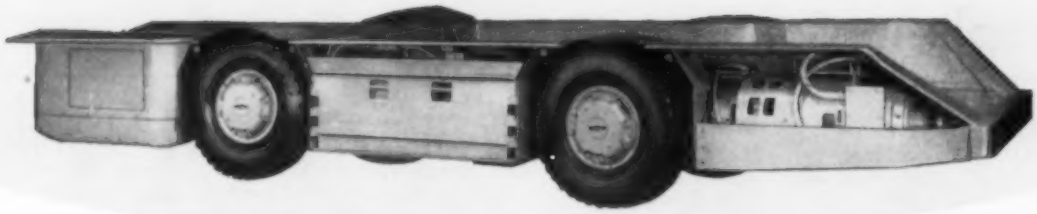
Need Small Coke—Companies in Canada and South Africa already use the basic process for making this coke, but in these countries the heat produced is used to burn lime, while in the Island Creek application it is used to produce steam. There is a growing shortage of small-size coke, reports the firm. If Island Creek can make this type of coke in combination with the generation of steam and power, it will help relieve the shortage and open a new road between the coal and chemical industry. So, Island Creek is pushing ahead.

Courage Above All

Five coal men have received the Holmes Medals of Honor for heroic action in saving the lives of other persons. They are: Max G. Broadhead, Columbia-Geneva Steel Div., U. S. Steel Corp.; Woodrow Evans, Pocahontas Fuel Co., Inc.; Alex Dutko, Marianna Mines, Bethlehem Mines Corp.; Hughie Wayne King, Wisconsin Steel Co., and Luther E. Allen, Clinchfield Coal Co.

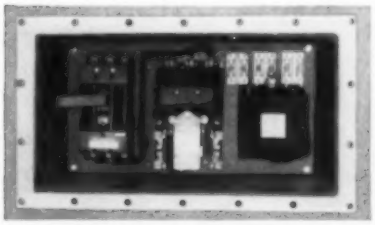
Max Broadhead entered a coke-oven gas separator to save a man who had been overcome by fumes. Woodrow Evans led his men to a remote section of No. 31 mine of Pocahontas Fuel Co., Inc., and barricaded off the section for protection against dangerous "after-damp" that followed a blast. Luther Allen rescued two workers at Bobs Branch Coal Co. mine at Haysi, Va., following an explosion. Alex Dutko volunteered to go down in an oil drum

(Continued on p 36)

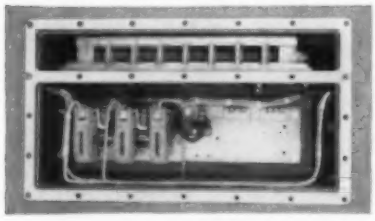


NOW, TORKAR* *economy* FOR THIN SEAMS

The NEW National Mine TorKar Type 30 A. C. or D. C. Shuttle Car



A. C. Control Panel



D. C. Control Panel

(with resistors and drilled to accommodate Ground Sentinel, if specified)

The maintenance and performance standards set by the Type 48 TorKar during the past five years now can be realized in thin seam operations. The new Type 30 TorKar (height from 30 to 36 inches) has the rugged body construction and all of the design features of the larger car. These include single A. C. or D. C. motor, efficient torque converter, three speed forward-and-reverse transmission, high-speed unloading, simplified wiring and electrical control, four-wheel drive and steering, interchangeable heavy-duty wheel units, and zoned or automatic lubrication.

For complete information on these remarkable new TorKars, consult your National Mine representative or write.

SPECIFICATIONS — Model 30

Motor: 17½ hp, A.C., 15 hp, D.C.
Base height without sideboards: 30 in.
Length with medium boom: 22 ft. 5¾ in.
Width: 95⅜ in.
Tire Size: 7.00/15
Tramming speed loaded m.p.h.: low, 1.68; second, 2.73; high 4.25
Capacity level full, cu. ft.: without sideboards, 105
Capacity level full, cu. ft.: with 6" sideboards, 154

*Trademark

National Mine Service Company

National Mine Service Company

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All-State Division, Logan, W. Va. | Anthracite Division, Forty Fort, Pa. | Ashland Division, Ashland, Ky. | Bemeco Division, Beckley, W. Va. | Clarkson Division, Nashville, Ill.
Kentucky-Virginia Division, Jenkins, Ky. | Western Kentucky Division, Madisonville, Ky. | Whiteman Division, Indiana, Pa. | Mountaineer Division, Morgantown, W. Va.

People in Coal

Success Not Counted Lightly

RAYMOND E. SALVATI climbed from the poverty of an immigrant Italian family, through the despair of a polio-ridden childhood and a self-supported education to become president of Island Creek Coal Co., third largest coal producer in the world.

On May 8, the accomplishments of this outstanding West Virginia industrialist were summed up with his reception of the 1958 Horatio Alger Award. The award, presented by the Horatio Alger Awards Committee of the American Schools & Colleges Association, is inspired by the fictional Horatio Alger novels, which symbolize the possibilities of success for every man in a capitalistic economy.

The committee could not doubt the courage and persistence of Mr. Salvati. Despite polio, which required him to wear braces till the age of 10, the plucky West Virginian sold papers on the streets of Monongah, W. Va. Later, he worked his way through high school and West Virginia University, after which, he went to work for Island Creek.

Stepping up through the ranks as assistant mine boss, superintendent, and vice president, he was elected to the presidency in 1949 and has led the firm successfully since then, buying new coal lands and initiating a foreign market for the company.

Mr. Salvati is now in the company of such greats as Charles E. Wilson, Milton Eisenhower, Herbert Hoover and Thomas E. Millsop, the latter being the only other West Virginian, ever to have won the award.

Glen E. Sorensen, Kemmerer Coal Co. executive, was elected the Wyoming Mining Association's third president, succeeding R. L. Moran. Mr. Sorensen has served for two years as vice president of the association. Other elections were those of **Myron L. Sisson,** superintendent for Colorado Fuel & Iron Corp. to the vice presidency and **H. D. Hand,** president of Globe Mining Co., re-elected as secretary treasurer.

John E. Caffrey is now chief engineer of U. S. Steel's Gary District. Mr. Caffrey, a native of Smock, Pa., has a BS degree in mining engineering from West Virginia University. He started work with U. S. Steel in 1949 as a chainman and successively held the positions of roof-bolting inspector, senior draftsman, assistant mining engineer, project engineer, senior mining engineer, assistant district industrial engineer and district industrial engineer. Mr. Caffrey, married, with one son, now lives in Gary, W. Va.

Paul Morton, executive vice president of Cannelton Coal & Coke Co. and Lake Superior Coal Co., has succeeded Frank O. Harris, retired, as president of the companies. Mr. Morton joined Cannelton and Lake Superior as assistant to the vice president in 1953. In 1956, he was made vice president and general superintendent, and in 1957, executive vice president, which position he has held until the new appointment. He is a graduate of New Mexico School of Mines with a degree in mining engineering.

C. A. Reed, who established the National Coal Association's Engineering Dept. in 1936 and has directed it since then, will retire on June 15. Mr. Reed, once secretary-treasurer of Bituminous Coal Research, Inc., pioneered the first nation-wide fuel engineering service in the coal industry. He worked with industry, the Government and large potential coal users to protect and promote consumption of coal. Before joining the NCA staff, Mr. Reed served in the Army during World War I and was then employed by Green Engineering Co. of Chicago.

Stanley B. Johnson has retired as president of the Lorain Coal & Dock Co. and as chairman of the board of the Lorado Coal Mining Co. He will continue to serve as a director of both firms and will remain active in a consulting capacity. Mr. Johnson is nationally prominent in the coal industry, having served as an officer of numerous coal organizations. His association with the Lorain Co., whose founders included his father, Edward Johnson, began in 1919.

No. 6 in a series

Right off the Wire

A computer-controller system is said to be capable of landing 120 jet planes per hour. Human control can average no better than 40 per hour.

Dockside facilities at SIMPLEX' Submarine Cable Division in Newington, N. H. are extensive enough to continuously load two of the largest submarine cable ships simultaneously.

A new plant is reported to cut the manufacturing time of industrial carbon components from eight weeks to eight minutes.

A "building block" technique, using miniature plug-in units, makes it possible to build an electronic computer small enough to go on an office desk.

An iron-aluminum alloy has been made, the behavior of which indicates that there is a relationship between rusting and magnetism.

Some fruit trees have been found to ripen earlier after long exposure to gamma radiation.

At least one of the new "exotic" rocket fuels is being made in solid form and others are expected soon.

A patent has been issued for a radioactive "go-devil" (a device for cleaning pipe lines). If it sticks in a pipe it can be located with a Geiger counter.

It is estimated that malicious damage to street lamps costs New York City a quarter of a million dollars a year. A new plexiglas globe makes this sort of vandalism almost impossible.

Instead of the usual bracing and shoring, inflatable cushions are being used to wedge freight tightly in box cars.

One of the new guided missiles is launched from an automatic base which computes the location of the attacking object, calculates its speed and the proper point for meeting it. It also loads and fires the missile automatically.

A micro-porous synthetic material holds a liquid, such as an ink or lubricant, and gives it off at a controlled rate.

Damage to small delicate parts on a conveyor can be avoided by a new belt that uses permanent magnets to hold the pieces apart.

Glass-reinforced plastics can be strengthened by the use of a special new glass containing copper oxide.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

A new wool-like synthetic fiber is water-repellent, quick-drying and less expensive than other synthetics.

A device for measuring the power output of a turbine involves an inner and an outer gear in constant mesh with free space between the teeth. This space is filled with oil on which the pressure can be measured.

Simplex Wire & Cable Co. was the first to adapt interlocked armor (CONDEX) for use with underground cable in 1924.

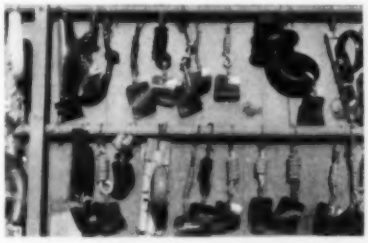
A logging company is using plastic nails to fasten logs together. They neither rust nor damage saw blades.

Paralyzed fingers can be made to move by means of tiny artificial muscles powered by a carbon dioxide cartridge.

Research conducted by two Simplex scientists in the early 1920's resulted in the first truly moisture-resistant rubber insulation. The isolation and removal of the proteins that are always present in natural rubber was the basis of the now famous ANHYDREX family of insulations.

Foamed aluminum is being made for use as a core in sandwich construction.

An electronic device checks the accuracy of aircraft guns without firing them.



Rooftop Laboratory

These cable samples, twisted and bent to exert maximum stress on insulations and jackets, are undergoing sun-crack endurance tests atop the Simplex plant at Cambridge. Many of these samples have been exposed to the elements for as long as fifteen years . . . and they haven't cracked yet. This is one example of the many punishing tests which Simplex insulating and jacketing compounds, such as Anhydrex, Thermoplex and polyethylene, are subjected to before they win final approval.

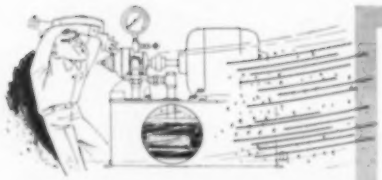
It's all part of a comprehensive system of quality control which has helped make Simplex the leader in cable research and manufacture.

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

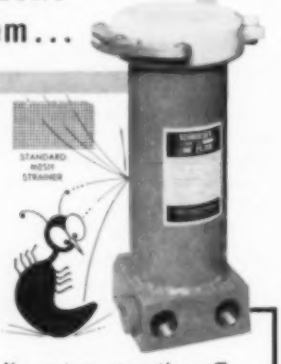
"The American manufacturers of transoceanic telephone cables"



Keep the storm out of your hydraulic system...

SCHROEDER
LINE FILTERS

Your hydraulic system operates in a storm of harmful dirt particles, both from the air surrounding your system and from dirt particles generated, through wear, within the system itself.



Increase your operating efficiency...

Schroeder Line Filters increase your hydraulic system operating efficiency economically! Harmful, minute dirt particles, which can pass through the standard mesh strainer in your system, are filtered out and prevented from wearing out pumps, valves and machine components. Operating temperatures are lowered . . . hydraulic fluid life is extended . . . corrosive action is minimized! Schroeder Line Filters, with their replaceable filter elements, *can remove particles as small as .000118 inch from your hydraulic system.*

SCHROEDER BROTHERS CORPORATION
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HYDRAULIC • ELECTRIC and PNEUMATIC EQUIPMENT

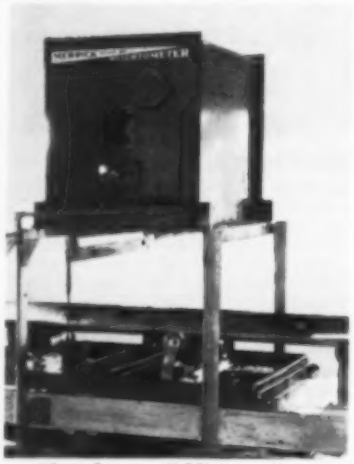
Optional Spin-Dicator provides visual supervision of performance.

since 1953., it was announced by A. R. Matthews, president of Consol. He previously had served as safety director, assistant general superintendent and general superintendent.

A native of Bristol, Va., he received his early schooling in El Paso, Tex. He graduated from the Bluefield Normal and Business College in 1909, later completing correspondence courses in mining and law. Mr. Sproles' headquarters will continue at Pocahontas, Va.

Obituaries

Andrew F. Denari, president of the Pittston Co., bituminous coal producers, died of a heart attack recently. Mr. Denari who was born in Brooklyn, left high school in 1919 before graduation because of his father's illness. He started his career in the coal business as a junior clerk with the Pennsylvania Coal Co. In 1930 the Pittston Co. was organized as a successor to the Pennsylvania Coal Co., and Mr. Denari was on the staff of the company's president at that time. In 1936 he became assistant secretary. He became assistant treasurer in 1938, secretary in 1939 and in 1943 became vice president as well as secretary. Three years ago Mr. Denari was named executive vice president and a director of the company. He was elected to the presidency in 1956.



Checking Efficiencies?
Want Accurate Weights?
Use the Weightometer

More than ever accurate incoming-outgoing and in-process weighing mean profit or loss.

MERRICK SCALE MFG. CO.
Engineers and Mfrs. of Automatic Weighing Equipment
PASSAIC, N. J.

People in Coal *(Continued)*

whose founders included his father, Edward Johnson, began in 1919.

A. Vernon Sproles, who has been associated with Pocahontas Fuel Co., Inc., and its predecessor companies for 50 yr, has been elected president of the Pocahontas Fuel Co. Division, Consolidation Coal Co. Mr. Sproles has been vice president in charge of operations

Meetings

Open Pit Mining Association, June 19, University of Kentucky, Lexington, Ky.

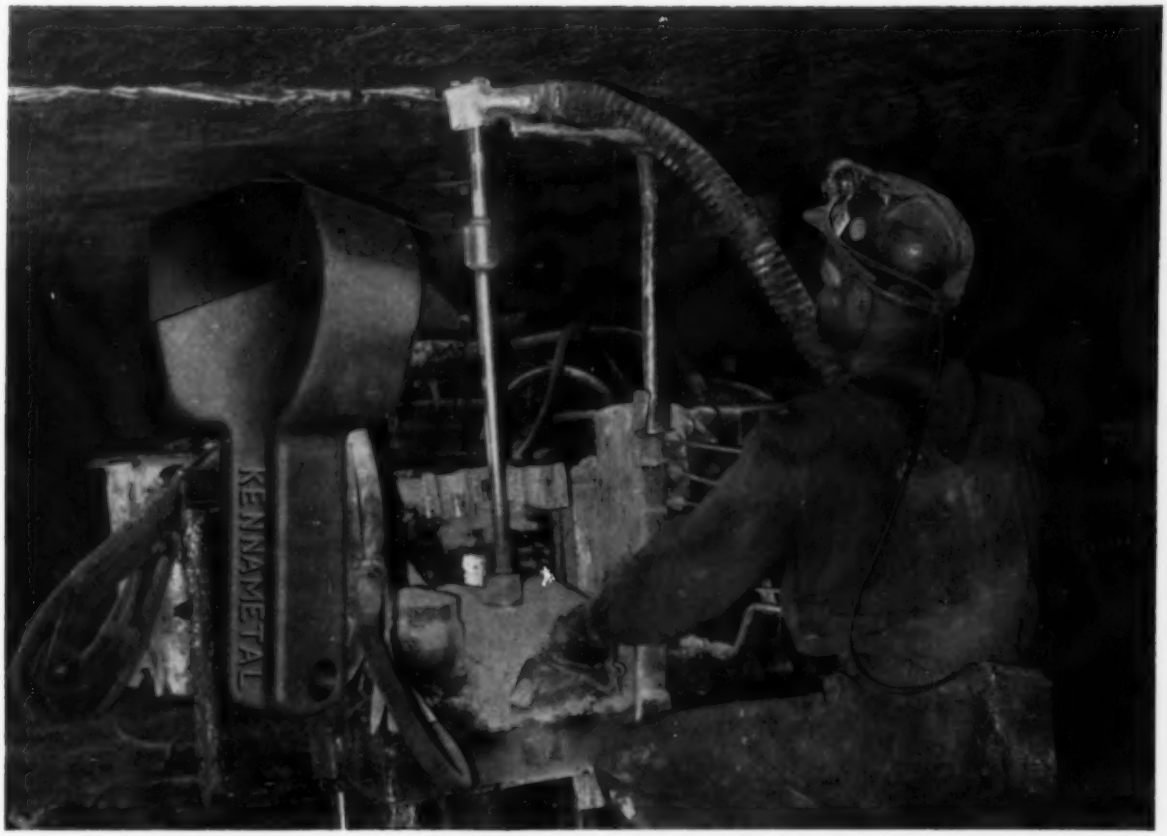
Mine Inspectors' Institute of America, June 22-25, Shirley-Savoy Hotel, Denver, Colo.

Rocky Mountain Coal Mining Institute, June 29-July 2, Hotel Colorado, Glenwood Springs, Colo.

Mining Society of Nova Scotia, July 3-5, Keltic Lodge, Ingonish Beach, Nova Scotia, Canada.

Coal Operators Golf Party (Western Pennsylvania), June 19 at Lakeview Country Club, July 10 at Uniontown Country Club, July 24 at Greene County Country Club, Aug. 7 at Monongahela Country Club, Aug. 21 at Nemacolin Country Club, and Sept. 11 at Greene County Country Club.

Central Pennsylvania Coal Producers' Association, Summer Meetings, June 25 at Indiana Country Club, July 24 at Somerset Country Club, Aug. 27 at Clearfield Country Club, Annual meeting, Oct. 2-3, Bedford Springs, Bedford, Pa.



Take full advantage of high powered drills with Kennametal FDC Roof Bits

No production delays here...

KENNAMETAL* Roof Bits keep roof bolting out in front

From actual performance records...

- 60 holes per shift drilled and pinned in laminated roof by one man
- 70 to 80 holes per shift drilled and pinned in solid sandstone by two men

Performance such as this is typical of what Kennametal FDC Roof Bits can do for you.

Modern drills make fast roof bolting possible, but the bits must be able to stand up under the added punishment. Kennametal FDC Roof Bits can take it, allowing you to take full advantage of high powered drills. Superior grades of Kennametal carbide withstand the severe shock and abrasion of high thrust and high torque. Roof Bolting Crews can work faster, allowing Face Crews to move in without delay. As a result, more coal is mined per shift, more money saved.

Let your Kennametal Representative help you select and actually test in your mine the Kennametal Bit designed to best match your operating conditions. Why not give him a call? You'll find his name listed in the Classified Section of your Telephone Directory under "Mining." Or, write KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania.

*Trademark

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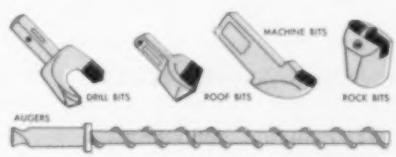
INDUSTRY AND KENNAMETAL ...Partners in Progress



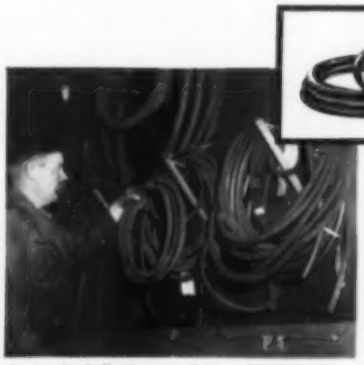
A load of coal emerging from the United Pocahontas Crumpler mine. The first Aeroquip Hose Line was installed in 1949 and is still in operation on hydraulic mining equipment.

"We Use Aeroquip Bulk Hose and Fittings to Replace Hydraulic Lines On The Spot"

Says Maintenance Official, United Pocahontas Coal Company, Crumpler, W. Va.

Deep mines like United Pocahontas' Crumpler bituminous mines cut replacement downtime and simplify fluid line maintenance with Aeroquip Hose Lines. Replacement hose lines are made quickly at the repair shop or right in the mine from a portable inventory of Aeroquip Bulk Hose and Reusable Fittings.

Dependable Aeroquip Hose Lines can help cut costs and downtime on your equipment. The Aeroquip Distributor listed in your Yellow Page Phone Book is ready to assist you. Why not call him today?



Aeroquip Bulk Hose and Reusable Fittings are used to make hose lines as they are needed. Only bench tools are needed.

Mechanic Paul Kirby installs a new Aeroquip Hose Line on the central lube system of the mine service truck.

Aeroquip

AEROQUIP CORPORATION, JACKSON, MICHIGAN

INDUSTRIAL DIVISION, VAN WERT, OHIO • WESTERN DIVISION, BURBANK, CALIFORNIA
AEROQUIP (CANADA) LTD., TORONTO 19, ONTARIO

AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

News Roundup *(Continued)*

that was to be lowered into a mine following an explosion that trapped five men. Hughie Wayne King saved the life of a friend by working his shoulder under a rock that had fallen on the man and clearing away debris freeing the trapped man. He then applied artificial respiration to his friend who had ceased breathing, finally reviving him.

It has also been announced that new and stiffer standards have been adopted for qualification for Joseph A. Holmes safety awards. These stricter requirements apply only to safety awards granted individuals, mines and plants for outstanding attainments. Advances in technology and lessening of certain hazards have made it easier for an individual mine or plant to work for long periods without accidents, Director Marling J. Ankeny, Holmes Safety Association, stated. The most significant change is in an upping of man-hours worked without a fatality or permanent total disability for award qualification.

Coal Laboratory

Consolidation Coal Co. officials are enthusiastic about the performance of a coke-testing laboratory, recently completed for their Research & Development Div. The laboratory will help provide information on improving the quality of Consol's own coal and to evaluate specific coals or coal blends which are not in industrial use. The laboratory, thus, has a double function —to give Consol scientists an inside track on the company's coal, and to aid the customers with their needs.

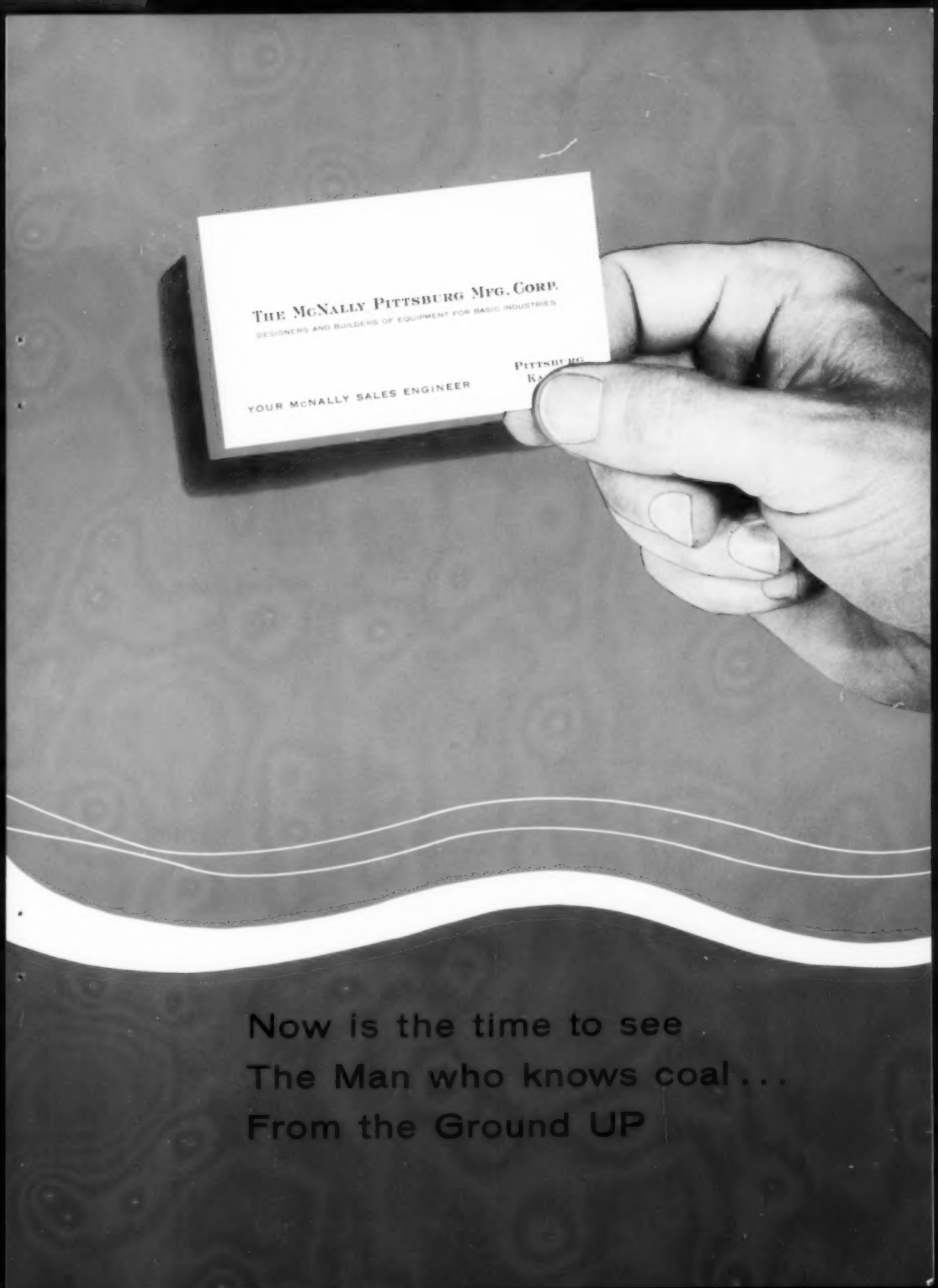
There are three main sections of the lab: the oven room, the coke-testing room and the laboratory for physical and chemical tests on coal. In addition to complete facilities in the coke testing area, extensive chemical and physical coal-testing equipment is available in the coal testing area, reports the firm. Such European coal testing apparatuses as a Jenkner retort, Micum drum and a Hoffmann dilatometer are included, in addition to conventional testing equipment. The company plans to add equipment as the need arises.

Lignite Study

The Texas Power & Light Co. agreed in 1950 to aid the Bureau of Mines in a study on low-rank western coals. Since then, most of the financial aid has gone into research emphasizing lignite-drying techniques, and recently, a report on the progress of the project was made by the Bureau.

The power company has built nine

(Continued on p 50)


THE McNALLY PITTSBURG MFG. CORP.
DESIGNERS AND BUILDERS OF EQUIPMENT FOR BASIC INDUSTRIES
YOUR McNALLY SALES ENGINEER
Now is the time to see
The Man who knows coal...
From the Ground UP

The Future Belongs to those who Prepare

CAPITAL COST PER TON

If a $1,000,000 coal preparation plant is written off in 20 years and produces about 20,000,000 tons of coal, then the capital cost comes to about 5c per ton. Some operations cost more, some cost less per ton depending upon the difficulty or completeness of preparation.

Of the total cost of a preparation plant, the cost of the beneficiating equipment is comparatively minor, as is the cost of the "magic ingredient" engineering design.

The job of the preparation plant is simply to separate the fuel from the inerts without losing fuel. Fuel lost in the process means cash loss.

Investing 5c per ton, then, gets to be a matter of finding the very best preparation equipment and design to realize the highest possible yield over a long period of time.

Of course, we'd like to suggest that at McNally Pittsburg we design and build preparation plants for the long haul and not for the illusory economy of cheap first cost.

Edward T. McNally

Edward T. McNally,
President

McNALLY PITTSBURG
MANUFACTURERS OF EQUIPMENT TO MAKE COAL A BETTER FUEL

McNally Pittsburg Manufacturing Corporation—Manufacturing Plants: Pittsburg, Kansas • Wellston, Ohio
Engineering and Sales Offices: Pittsburgh • Chicago • Rio de Janeiro • Pittsburg, Kansas • Wellston, Ohio

1975

1970

1960

1958

Current Coal Patents

By: Oliver S. North

Method and apparatus for treating a solid material, L. T. Work (assigned to Texaco Development Corp., New York, N. Y.), Apr. 15, 1958. Method and apparatus for drying or pulverizing coal or distilling volatile materials therefrom. A liquid slurry of coal is passed through a vaporizing chamber, wherein the solid particles are dispersed in the vapor. This dispersion is discharged from the chamber and treated in any of various ways. No. 2,830,769.

Mining drill bit, W. Weese, Apr. 15, 1958. Drill bit having a replaceable tip and particularly adapted for coal mining. Tip has a pair of twisted arcuate arms having sharp cutting edges extended from a shank. No. 2,830,796.

Gasification of sulfur-bearing carbonaceous fuels, D. B. Eastman (assigned to The Texas Co., New York, N. Y.), Apr. 15, 1958. Method for removal of sulfurous gases from the products of partial oxidation of a sulfur-containing coal. The coal is admixed with lime and reacted with oxygen-containing gas under pressure and at a temperature above 200 F. Molten material is withdrawn and quenched with water to dissolve the lime. Hydrogen sulfide gas is removed from the lime-water, and the product gas contacted with the desulfurized lime-water. No. 2,830,883.

Rope side-frame conveyor with nonwalking supporting stand, A. H. Newbury (assigned to Goodman Mfg. Co., Chicago, Ill.), Apr. 22, 1958. Improved ground-supported stand for a rope-side frame belt conveyor. A frictionless rotatable sheave or hardened curved shoe is provided between the supporting stand and the wire ropes. Ropes can shift back and forth freely without moving the stand. No. 2,831,567.

Extensible flexible shaker conveyors, C. F. Ball (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Apr. 22, 1958. Improved shaker conveyor of the type in which a flexible element is stored on a reel or drum and drawn off as the working length is increased. No. 2,831,568.

Expansion bolt having expanding jaws secured to elastic cup-shaped member, G. Allimann, Apr. 29, 1958. Improved bolt for mine roof bolting comprises at least one clamping jaw co-operative with a wedge-like surface on the head of the anchoring rod. Expanding element is initially jammed against the wall of the bore. Screw and wedge movement of the rod after placement is largely eliminated, so that the end of the rod is not pushed out into room when roof pressure is exerted. No. 2,832,253.

Conveyor mechanism, J. D. Russell (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Apr. 29, 1958. Improved conveyor mechanism made up of a series of articulated sections supported by skids engaging the rails of the tunnel trackway. The skids have surfaces over which the wheels of the mine cars may travel. No. 2,832,482.

Mobile roof drill, J. R. Fletcher and W. F. Fletcher (assigned to J. H. Fletcher & Co., Chicago, Ill.), Apr. 29, 1958. Improved form of mobile drill for drilling holes in mine roofs, par-

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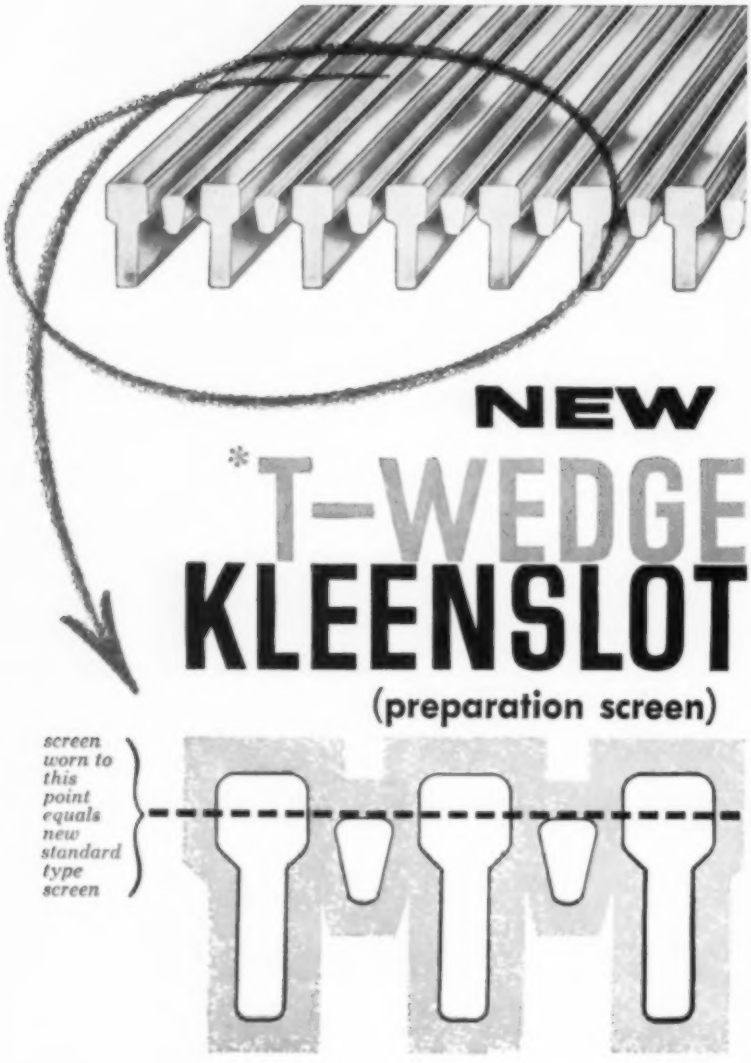

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Patents (*Continued*)

ticularly in hard rock. Drill carriage is vertically guided along a mast braced between floor and roof. This assures a straight hole during drilling, and prevents wandering of the bit when starting the hole. No. 2,832,567.

Mining machine bit tip patterns, A. L. Barrett (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Apr. 29, 1958. Tip patterns for the disintegrating elements of a mining machine, wherewith a maximum of large lump coal is produced with a minimum of fines. No. 2,832,579.

Coal hydrogenation process, E. W. Doughty, J. H. Powell and M. A. Eccles (assigned to Union Carbide Corp., a corporation of N. Y.), Apr. 29, 1958. Process for reacting hydrogen with coal to form hydrogenation products. Pulverized coal is separately heated and then dispersed in hot pasting oil whereby the temperature of the mixture is 325 to 400 C. Hot paste is mixed with hydrogen under pressure to produce hydrogenation products. The pasting oil fraction is recovered and re-cycled in the heated state. Mixing coal and oil fractions that are already heated eliminates viscosity difficulies. No. 2,832,724.

Apparatus and method for fluidized drying of carbonaceous fuels, J. C. Wright (assigned to Silver Engineering Works, Inc., a Div. of Silver Corp., Denver, Colo.), May 6, 1958. Process and apparatus for utilizing hot combustion gases for drying or vaporizing volatile ingredients from carbonaceous solids, such as low rank coals. Process achieves results without any substantial thermal decomposition of the coal. No. 2,833,055.

Shaker conveyor loading device, E. R. Bergmann (assigned to Goodman Mfg. Co., Chicago, Ill.), May 6, 1958. Improved loading pan reciprocably driven by a shaker conveyor pan line and forming a continuation of the end thereof and fed laterally across a coal face, for loading coal onto the pan line. Construction of loading pan enables it to work under the coal and avoid climbing upwardly along the loose coal. No. 2,833,389.

Support assembly for conveyor, R. F. Lo Presti (assigned to Goodman Mfg. Co., Chicago, Ill.), May 6, 1958. This assembly for supporting the conveying reach of an endless conveyor can be readily connected to like assemblies so as to lengthen conveyor as workings are extended. No. 2,833,395.

Separating apparatus with constant flow rate control, M. Bosman and J. M. H. Beckers (assigned to Stamicarbon

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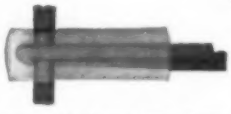
First, thread fuse from shot hole through length of connector. Then, press the trunk line into the grooved slots.



Next, return the branch line through the end of the connector on the other side of the trunk line. Pull both ends of branch line tight for positive connection.

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Patents (*Continued*)

N. V., Heerlen, Netherlands), May 6, 1958. Upward current apparatus for separating mixtures of coal and waste particles according to specific gravity and/or particle size. Upward current is maintained substantially constant at a value corresponding to the settling rate according to which separation is being effected, notwithstanding fluctuations in load and type of feed material. No. 2,833,411.

Means for discharging granular products in wet treatment apparatus, E. Harvengt (assigned to Link-Belt Co., Chicago, Ill.), May 6, 1958. Improvement in discharge of coal from washing apparatus. A vertical conduit associated with the concentrating pan discharges product to a support, down which the material slides and is recovered. No. 2,833,414.

Portable drilling machines, C. Augsburger (assigned to National Fireproofing Corp., Pittsburgh, Pa.), May 6, 1958. Electric-hydraulic mine roof drilling apparatus having a tiltable drill support which, when tilted for uphole drilling, is rigidly supported by resting on the mine floor. No. 2,833,518.

Mobile base for mining machines, J. F. Joy (assigned to Joy Mfg. Co., Pittsburgh, Pa.), May 6, 1958. Improved mobile base structure for a mining machine, wherewith the machine may be fed over the mine floor and steered to either the right or the left. No. 2,833,531.

Anthracite Output

YEAR TO DATE	PRODUCTION
May 10, 1958	138,614,000
May 11, 1957	184,383,000

1958 output 24.8% behind 1957.
A month earlier output was 23.0% behind 1957.

WEEK ENDING	PRODUCTION
May 10, 1958	6,180,000
May 11, 1957	9,602,000

Bituminous Output

YEAR TO DATE	PRODUCTION
May 10, 1958	7,571,000
May 11, 1957	9,363,000

1958 output 19.1% behind 1957.
A month earlier output was 18.1% behind 1957.

WEEK ENDING	PRODUCTION
May 10, 1958	396,000
May 11, 1957	479,000

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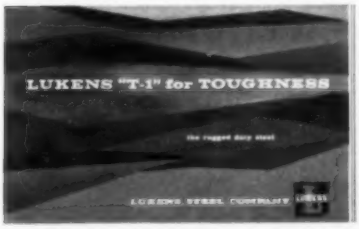

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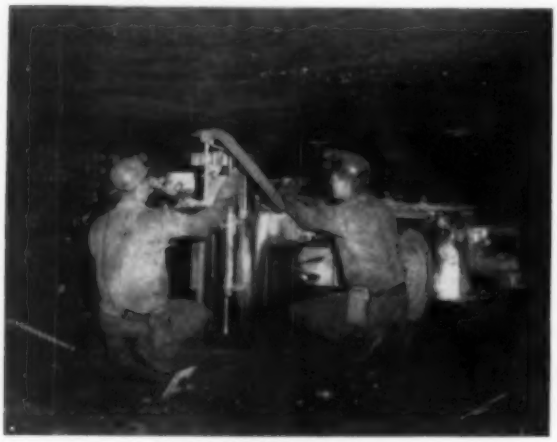

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West Virginia Firm Adds Bucyrus-Erie Walker To Uncover Deep Coal Seams

To reach deeper coal seams, a Bucyrus-Erie 1250-B walking dragline has gone to work in Pennweir Construction Company's open pit mine. Pennweir Construction Company is a subsidiary of Weirton Construction Company. The mining property, covering some 6,000 acres, is on the West Virginia-Pennsylvania border about 25 miles southwest of Pittsburgh.

The 1250-B handles a 33-yd. bucket on a 200-ft. boom to uncover seams of bituminous Pittsburgh Eight running 58 inches thick.

This machine — christened the *Angeline* — brings a substantial yardage increase to the Weirton operation. In addition to moving overburden high and wide, it moves it economically — a tradition of Bucyrus-Erie walking draglines.

Modern front end design combining great strength with light weight permits Bucyrus-Erie walkers to swing big buckets on long booms . . . contributes to outstanding performance. Ward Leonard variable voltage control gives you extra fast acceleration and deceleration for speedy cycles. Exclusive Bucyrus-Erie walking mechanism permits smooth, fast moveups, easy maneuvering to best working position. These features plus month-after-month dependability and low maintenance are your assurance of high production.

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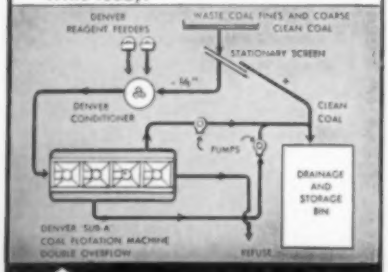


DENVER
EQUIPMENT CO.
1400 Seventeenth St. Denver 17, Colorado

Coal Abroad

Big Coal Plans

Red radio reports that China will overtake Britain's coal output by next year.

Red China is talking big about its future coal production. Peking radio quoted the People's Daily, a communist newspaper, as claiming a staggering increase in coal production for next year —a total of 230 million tons, based on the first four months of production in 1958.

With increased mechanization, Red China will be able to produce 300 million tons by 1962, states the report. Comparing their output with Britain's, the Reds feel that they will easily outdistance that free world country's production of 223,200,000 tons last year. This is not startling because Britain's coal production has been dwindling.

The year 1958 was a turning point in the development of China's coal industry, continues the report. "Conservatism was wiped out during the rectification campaign and greater reliance placed on local coal enterprises," the editorial pointed out.

GERMANY

New Method

German mining company, Essener Steinkohlenbergwerke AG., has gotten up to 40% efficiency in coal production by using streams of water for separating coal from the rock bed. The company got the idea from Russian mining experts, and have been carrying out experiments in the Ruhr mine, "Consolidation," with pressures of 150 to 200 atmospheres. Prospects also look good, it is reported, for producing coal from half-steep and steep rock beds.

So far, the mine has produced the pressures required with a high-pressure tank because no suitable pump has been available on the German market. In order to switch from alternating to continuous operation, they have bought a pump specially made to order from the firm, Winter, of Ratingen. This pump has a capacity of 280 liters per minute, 163 hp, and produces 200 atmospheres. It is presently on the test stand and will soon be used for further expanded operation by Essener.

Russian experiments evidently date back before World War II. The Russians claim the idea was conceived by Soviet mining engineer, W. Mutschnik, in the early Thirties, and was published in 1935 by the magazine, "Technika." Practical experiments started in 1939 in the Donets basin and were resumed in 1952 in the Kuznetz basin.

The Russians use lower pressures than the Germans, say reports. A large stream of water is directed against the coal stratum from a hydromonitor, with pressure of 35 to 40 atmospheres for separating the coal. The coal-water mixture flows through an intermediary or haulage-way with a descent of 3 to 5 deg into a basin. Coal pumps transport the mixture to the conveyor shaft where it is hoisted by hydro-bucket elevators or, in pipes, by a coal suction apparatus. The coal is then dehydrated in a special settling tank and the water used again.

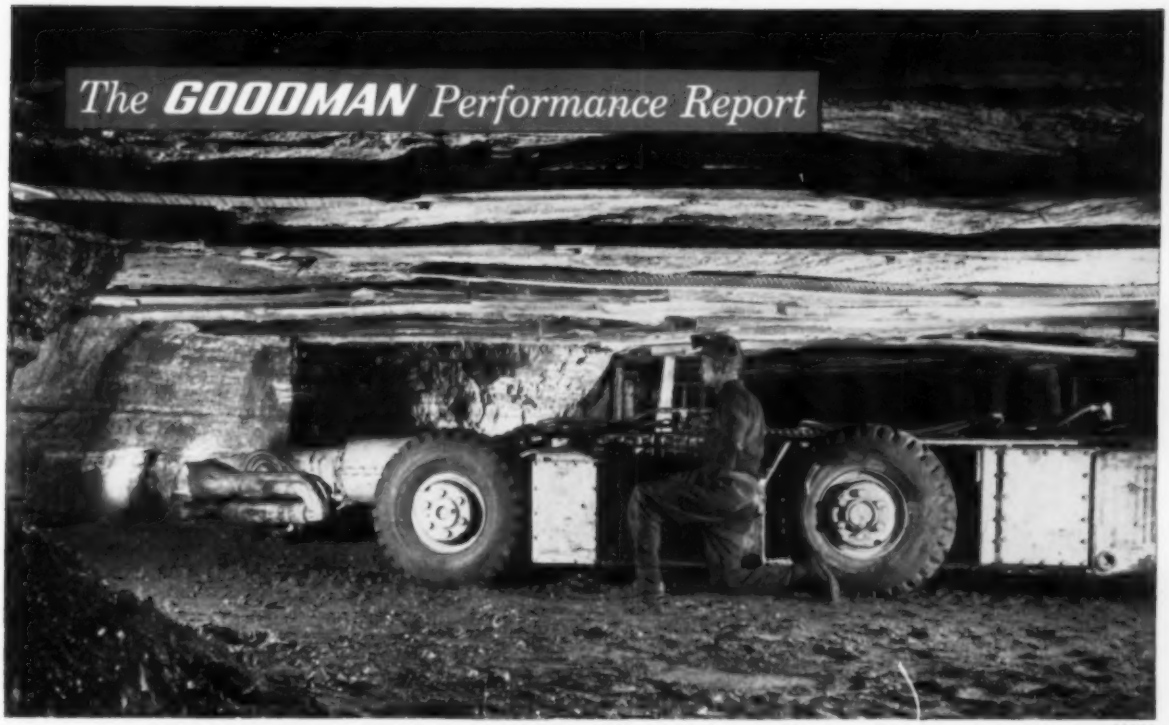
OVERSEAS FLASHES

POLAND—The Communist party paper in this country complains that the loss which Poland's foreign trade has suffered in connection with the United States' coal shipments to western Europe amount to roughly three times the funds which Washington has allocated Poland in the form of economic aid. The fact that the United States undergoes a state of "recession" right now, and also because of U. S. shipments of coal to western Europe, have decreased the coal price in Europe by $10 to $11 per metric ton. This deterioration, states the paper, has cost Poland three times the amount granted as U. S. credit.

LATIN AMERICA—The Latin American republics will need $5,392,000,000 in foreign capital by 1965 to develop their electricity, oil and coal resources to meet the requirements of a growing economy. This figure is based on a United Nations study of the economics of energy development in Latin America, which assumes that the region as a whole will have an annual increase in per capita gross product of 2.5% over the period 1955 to 1965. Whether any substantial aid will be forthcoming from the United States after the recent outbursts in Peru and Venezuela is a testy question.

GERMANY—Coal and coke stockpiles at German mines have been increasing rapidly until they stand now at about 3 million tons, 1.56 million of coal and 1.38 million of coke. Daily increases in coal stockpiles represent about 10% of the current coal output per working day—485,000 tons—and increases in coke stockpiles about 16% of the daily coke output—111,000 tons.

SOVIET RUSSIA—Spurred by her success with mechanized mining, Soviet Russia is reportedly planning to reach 1 billion tons of coal production an-



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It's no problem when you have a Goodman rubber tired machine on the job. Any one of the machines in the 2400 series moves anywhere in the mine. Each has a tramming speed of 220 fpm, and with a 90" wheelbase has full maneuverability even in limited space. There is easy, positive hydraulic control of speed and steering, brakes are disc type.

At the face a variable speed, hydraulic feed of the cutter arm insures fast cutting. As to cutting range, there are two machines—one 34" high and one 40½" high—that top, center, bottom cut or shear with no blind spots from top to bottom, or from rib to rib. Then there is a 34" high machine that can be arranged for either top cutting or bottom cutting.

For bottom cutting machines the famous Goodman bugduster automatically controls cuttings, eliminates a dust hazard, leaves a clean kerf.

The cutting motor and hydraulic motor on all machines are custom-designed and built by Goodman for either AC or DC operation. Performance is safe and fast. Conveniently located hydraulic controls on both sides of the machine, respond quickly . . . smoothly to your operator's touch.

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As for maintenance—a Pennsylvania mine using the Goodman Cutter reports two years of triple shift operation with only negligible attention. Another mine reports no replacement parts needed after 15 months of double shifting. Both were working in pitching seams.

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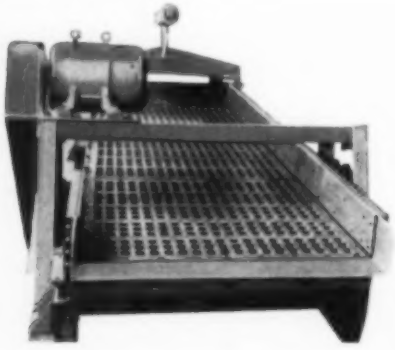

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Coal Abroad *(Continued)*

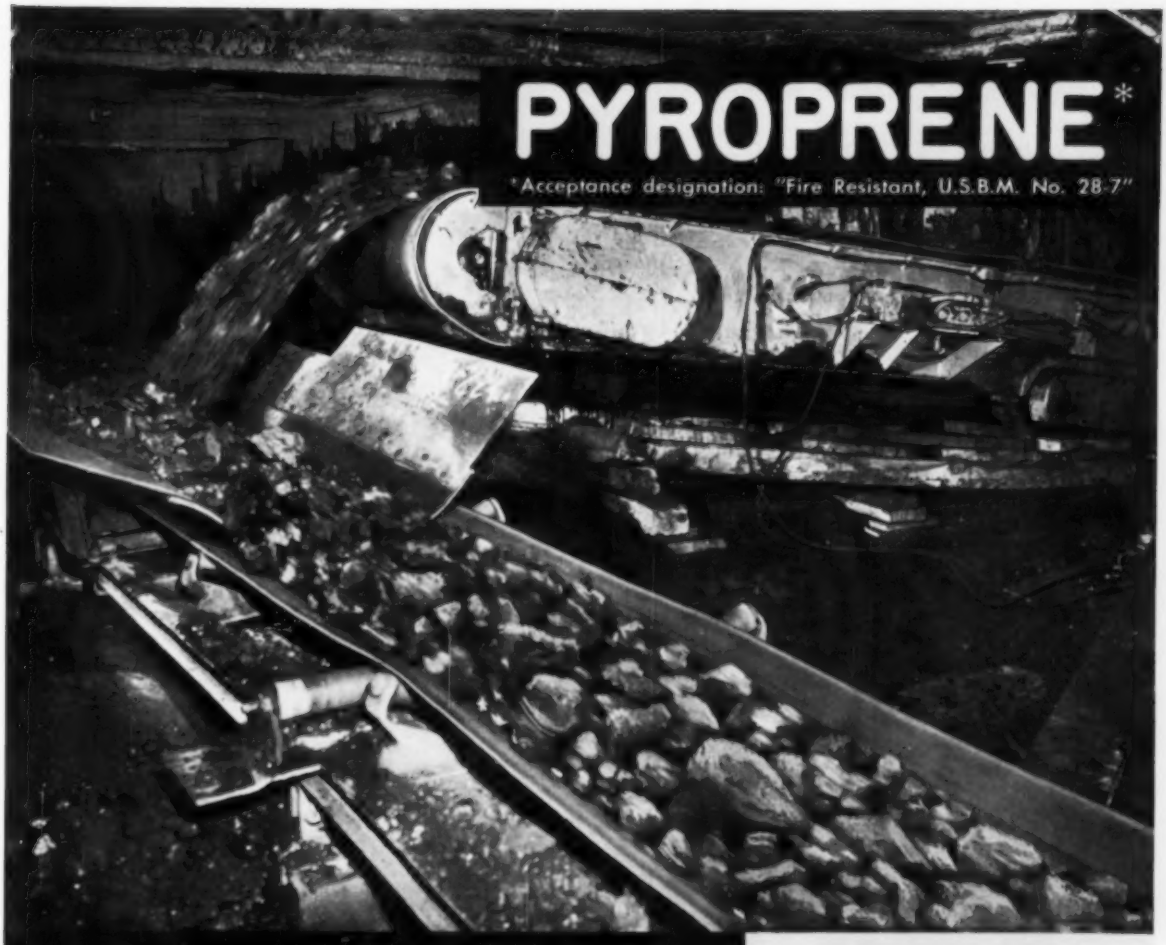
nually within 10 yr. Apart from opening new pits, the increase is to be effected by fully automating all existing major pits. The average daily output of large pits, which is at present 930 tons per pit, is thereby to be raised to 20,000 tons, according to reports.

BRITAIN — England's National Coal Board lost $14.8 million last year according to the board's annual report published recently. The total deficit incurred since nationalization of the coal industry is now 81.2 million. The 1957 output of around 223.6 million tons, is only 1.4 million tons higher than in 1956. After taking a long, hard look at Britain's ailing coal industry, a parliamentary committee studying the situation took both the Government and the NCB to task on four counts—prices, manpower, investment and coal stocks. Any further increases in the price of coal will tip the scales in favor of oil as an industrial fuel, the committee warned.

RED CHINA—Changchun Motor Vehicle Plant has put out its first coal-burning lorry truck. The truck has an automatic power-driven blower and is the second new type of truck placed into production this year. The coal-burning lorry has a load capacity of 3.5 tons, it is reported, and can haul a trailer with a load of two tons at the same time. Newsmen report that the parts come from the Soviet Union.

INDIA—A $330,000 ICA project for the study of lignite processing in India has been delivered to Madras State in southern India for on-site construction at the Neyveli lignite development, according to an announcement by Silver Engineering Works, Inc., Denver, Colo., producers of the equipment pioneered by the late V. F. Parry of the U. S. Bureau of Mines. Tests conducted in Denver show that in spite of high moisture content the Madras lignite may be processed to spark industrialization in the state. Coal is now imported 1,500 mi by rail to Madras.

Equipment supplied by Silver Engineering includes crushing, drying, briquetting, carbonizing and distillation units, with all necessary auxiliaries and instrumentation. The Parry process is built around a fluidized dryer and a carbonizer. The Neyveli installation is designed for pilot-plant drying of 2½ tph of raw lignite containing 56% moisture and producing a dried product of 10% moisture. Briquetting equipment will press one ton of dried lignite per hour and feed the briquets to the continuous carbonizer. The carbonizer will handle 500 lb per hr of briquets under experimental conditions when distilling at from 1,000 to 1,400 F. Commercial application of similar units has been made in the United States.



Ten ways a Pyroprene belt will increase safety and service

A conveyor belt's resistance to fire is of prime importance—but important, too, is its ability to outlast severe service conditions, haul maximum tonnage with no time lost for repairs and replacements. Pyroprene belting has this ability to convey more coal at less cost because it is built to combat mine service hazards.

1. Pyroprene belting resists fire
2. Will not support combustion
3. Not affected by oil or grease
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7. Resists abrasion
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10. Resists gouging

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units which are now drying about 6,000 tons of lignite daily to serve its electric generating plant at Rockdale, Tex. These commercial installations are modeled after a 5-ton pilot plant developed in the Bureau of Mines laboratory at Denver.

Bureau personnel, it is reported, helped operate the big units at Rockdale during the shake-down period, and trained the utility companys employees. Another phase of the research, in which the power company also cooperated, resulted in development of a process for carbonizing lignite to get a finely divided char for boiler fuel and low-temperature tar, a potential source of chemicals. The close cooperation between Texas Power and the Bureau serves as an example for other utility companies which might profit from research and development.

Coal Education

The Vocational Training & Education Committee, National Coal Association, met on April 11 and 12 at the Colorado School of Mines, Golden, Colorado. The members of the committee were taken on a tour of the buildings at the school to get things rolling.

Chairman Henry C. Woods presented an address to committee and faculty members, in which he expressed the purpose of the committee in visiting educational institutions. He spoke of the opportunities for graduates in the coal industry and urged better preparation for entrance to enginering courses while students are in high school.

Later the history, objectives and curricula of the school were discussed, at which time, Professor Lute J. Parkinson, department head, stated that there were 163 students in mining and that a determined effort was being made to train them so they would become useful members of the mining industry.

After a tour of school museum with mining equipment, modern and historical, the group heard Dr. R. F. Campbell discuss the work of the National Coal Association and a report on a short film to be used in high schools to show students the work of a mining engineer in college and immediately after graduation. Finally, it was agreed that the Committee would assemble at Pennsylvania State University in October, 1958.

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Salt Lake City, Utah

Mines, Companies

Eastern Gas & Fuel Associates will begin June 23 its 24th successive year of operating summer camps for children of mine and store employees.

By the end of the summer, approximately 900 boys and girls between the ages of 8½ and 14 years will have enjoyed two weeks of camping at either Camp Thomas E. Lightfoot, near Hinton, W. Va., or Camp Washington-Carver, near Beckley, W. Va.

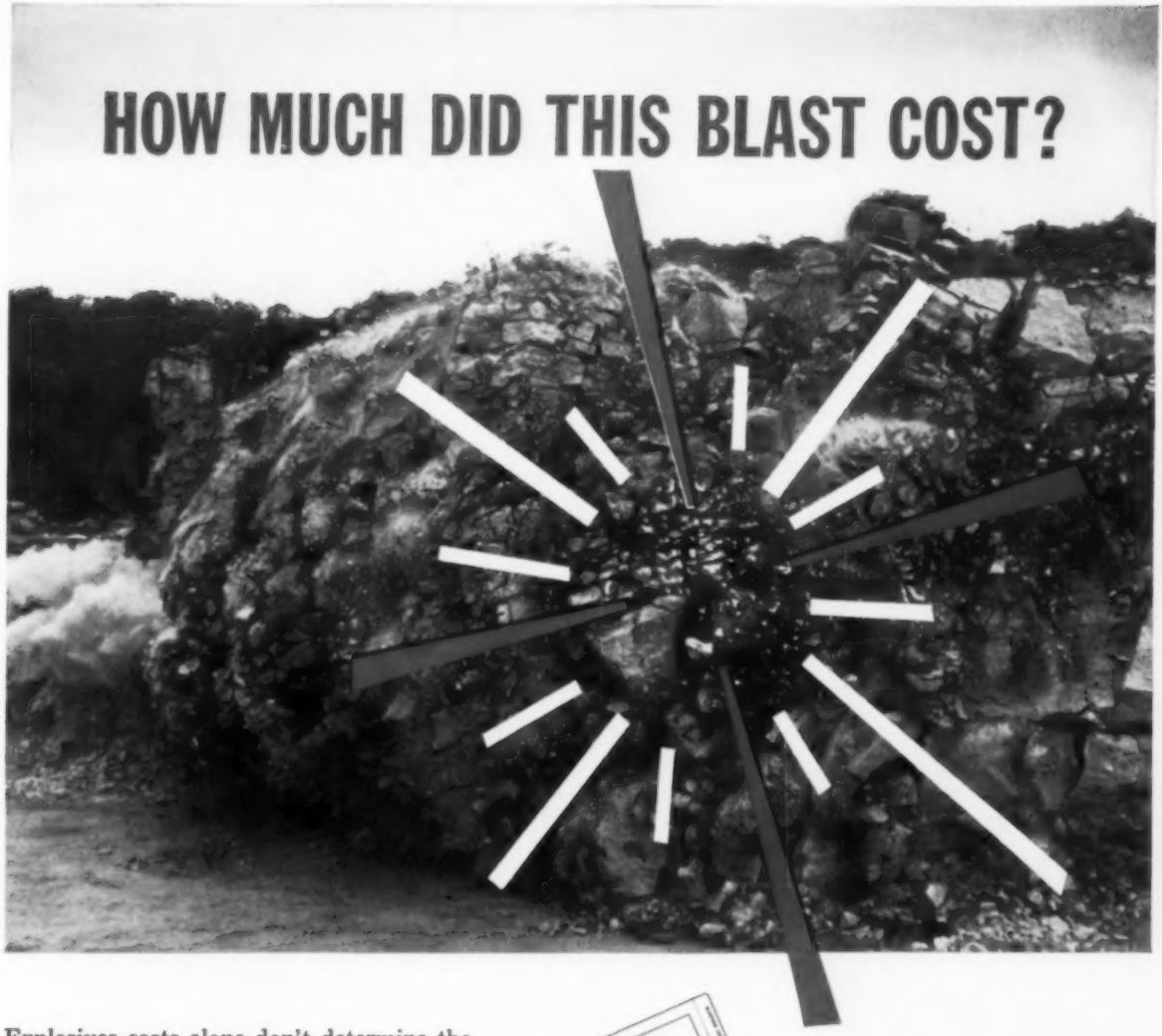
Sahara Coal Co., Chicago, has granted nine scholarships in mining engineering at Wisconsin Institute of Technology, Platteville, Wis.

Sahara's chairman of the board, Henry C. Woods, who is also chairman of the Vocational Training and Education Committee of NCA, announces that the scholarships are to be awarded annually to students chosen by a school committee headed by President Milton A. Melcher of Wisconsin Institute. Applicants should write to the Board of Admissions at the Institute.

Construction work at new Moss No. 3 mine, Clinchfield Coal Co., Division of The Pittston Co., is proceeding on schedule.

Norfolk & Western R. R. reports that its 8,240-ft tunnel is holing through to provide rail service to the 1,300,000-

HOW MUCH DID THIS BLAST COST?



Explosives costs alone don't determine the value of a given blast. The explosives you use have a direct effect on the whole operation: drilling, digging, hauling and crushing.

You can find out, quickly and easily, the true, complete cost on any blast by using the new, simplified computing method developed by Atlas. It's called the Blasting Cost Chart, and it's yours without cost or obligation.

Use this new method to learn your real blasting costs. It will help you plug profit leaks and come out money ahead in your blasting. Your nearest Atlas representative will show you how the chart works, and you can keep the actual figures within your own organization.

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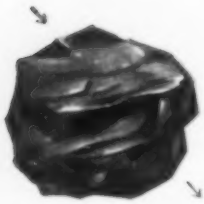

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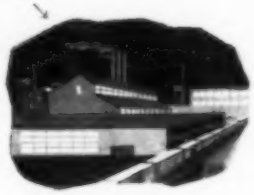
to prepare YOUR coal...

to satisfy YOUR customers...



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Your customers come first in the thinking of R&S engineers when they design your coal cleaning plant.

Your plant must be engineered specifically to prepare *your* coal to satisfy the exacting requirements of *your* customers. It must have the flexibility and capacity to meet varying market demands and the design and equipment to assure efficient, economical operation.

You can depend on the Roberts & Schaefer organization for the creative engineering skills, long experience in the coal field, and resources and facilities required to design for you a plant that will meet your exact requirements.

Roberts & Schaefer has pioneered many new developments in plant design and in coal preparation facilities and provides a comprehensive service including initial process studies, structural, mechanical and electrical design, installation and construction.

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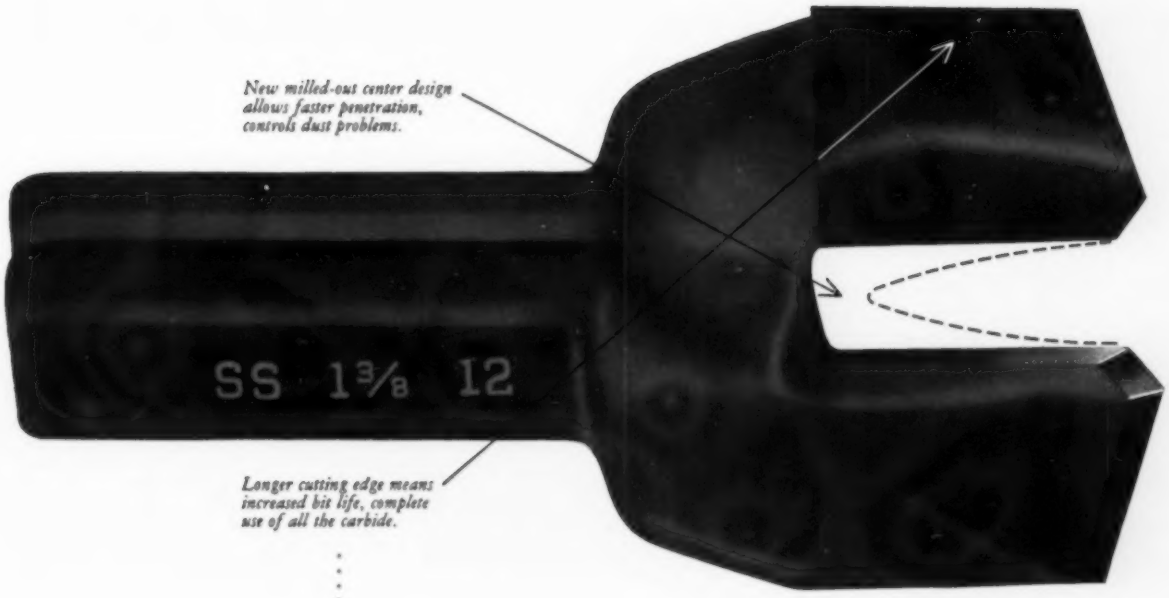
New milled-out center design allows faster penetration, controls dust problems.
SS 1⅜ 12
Longer cutting edge means increased bit life, complete use of all the carbide.

Carmet SS Style Roof Bolting Drill Bit

FREE-FLOWING BIT DESIGN CUTS ROOF HOLE DRILLING TIME 25 PERCENT

The outstanding performance of Carmet's Style SS roof drill bit has been proven over the years in tests and under actual operating conditions in mines throughout the country. This sturdy mining bit consistently drilled faster, cleaner and more accurately than others on the market.

Now, the newly modified milled-out center design of the SS Bit allows freer passage of large cuttings for even greater drilling speeds. It can save you up to 25 percent drilling time. The problem of dust control at the face is practically eliminated.

The harder, more wear-resistant Carmet Carbide grades used on all Carmet mining tools guarantee a longer operating life for the SS Bit and greater economy of operation for you. Heavy alloy steel support under the cutting tip insures against carbide fracture and strong prongs insure against tool breakage. SS Bits are available in the following sizes: 1⅜, 1⅞, 1½, 1⅝, 1¾ and 1⅞.

See your Carmet Distributor today for more information on the SS Style Roof Bolting Drill Bit . . . and also, ask him about Carmet's complete line of mining tool bits.

WSW 7192

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The newly revised 5th Edition of the Carmet Mining Tool Catalog contains application data and specifications on the complete line of Carmet Mining Tools, including a complete section on grinding and reconditioning. For your copy, write Carmet Division, Allegheny Ludlum Steel Corporation, Detroit 20, Michigan.

ADDRESS DEPT. CA-6

The Original DOUBLE-BONDED Carbide Cutter Bit

CARMET AL

Mines, Companies (*Continued*)

ton mine. Coal from Moss No. 3 will be used at the new Clinch River plant of the AGE system.

Southern Electric Generating Co. will spend approximately $20 million in developing a new coal mine at Parrish, Ala., which is projected to an annual production of 1½ million tons by 1961.

SEGC has acquired extensive coal reserves in both the Warrior and Cahaba coal fields, and plans development of additional mines to supply fuel for the company's new $150 million Wilsonville steam-electric station. A $500,000 contract has been awarded to Cowin & Co., Inc., Birmingham mining engineers and contractors, covering initial development of the new mine in the Mary Lee seam. The property will be known as SEGC Mine No. 1, and create employment for 500 persons, says James F. Crist, president of the company.

Koehler mine, Kaiser Steel Corp., Raton, N. Mex., is producing coal following a $900,000 modernizing program.

Production of from 500 to 600 tpd is expected now as the modernized property comes back into operation, according to an announcement by J. Kastler, superintendent. Most of the coal will be shipped to Kaiser's mills at Fontana, Calif., although demands of domestic customers also will be filled. Construction of two buildings for offices, shops, changehouse, lamphouse and warehouse is now underway at the Koehler site.

Utilization

Production of metallurgical coke from Illinois coals is increasing.

Hubert Risser, research engineer, Illinois State Geological Survey, points out that in 1951 only 2.6% of the coal used in Illinois-Indiana steel production was mined in Illinois, while in 1957 the percentage had climbed to more than 4%. Illinois coals can be substituted for high-volatile eastern coking coals to produce metallurgical coke because of the cost advantage in favor of the local coals.

Continuing demand for anthracite jewelry has inspired a new item from Le Beau.

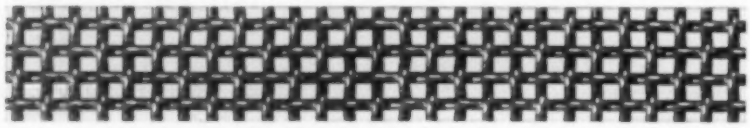
The latest addition is a set of three dress-shirt studs to match the coal-and-silver cuff links now available. The set of three costs $6, and may be obtained from Anthracite Information Bureau, 342 Madison Ave., New York 17, N. Y.

Supplies of coal in the Roslyn-Cle Elum area, 100 mi southeast of Seattle, are ample to supply a steam power plant.

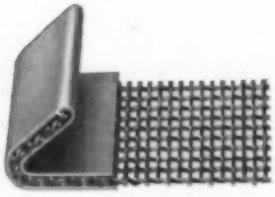
This was the decision presented to the Washington State Power Resources Board by Dr. L. C. McCabe and T. G. Gerow, consultants. The committee, working with Kittitas County officials, is

Coal Men on the Job

PEABODY COAL CO. OFFICIALS Fred Rice (left), Tony Shimkus and William Hatfield discuss the day's operations at the end of a shift in the company's Illinois deep mines.



TYLER SCREENS LAST LONGER



Tyler Type "AX" Hook Strip. For wire diameters from .047" to 5/16" inclusive.

Tyler Woven Wire Screens are woven with laboratory approved wires on precision machines. The high quality of Tyler Screens is apparent in their long life and service under the most difficult of screening conditions.

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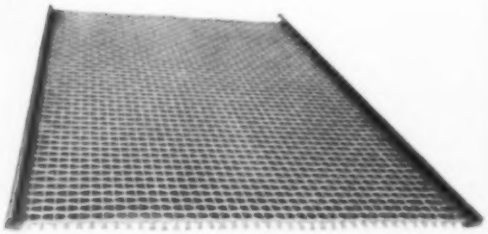
Tyler Screen Sections are furnished for all makes of vibrating screens in all meshes and metals. Each section is fabricated with the right type of edge or hook strip for the specification of screen cloth and to fit the particular make and model of screening machine on which it will be used.



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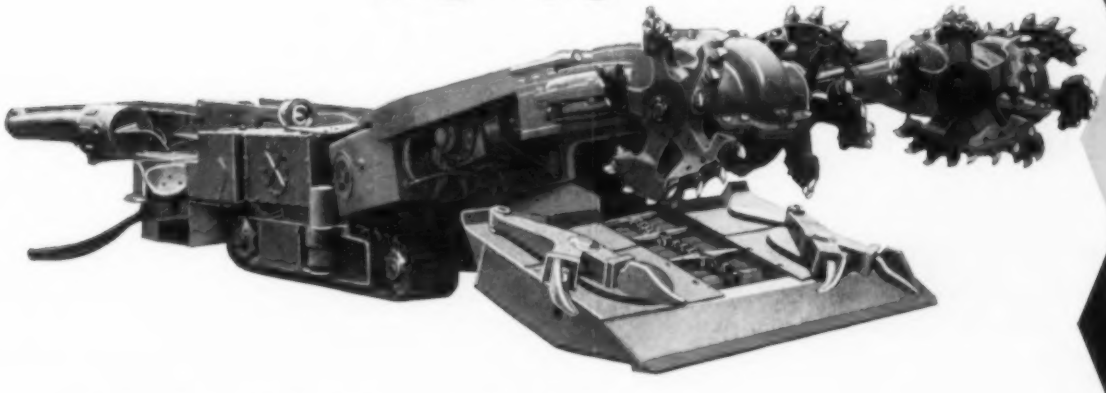

PATTERN CUTTING—*only Lee-Norse has it.*

CUTS MORE COAL WITH LESS POWER . . . *cutters revolve and oscillate at the same time—milling the coal from the face.*

CUTS A COARSE PRODUCT—FEWER FINES . . . *cutter bits follow a right and left spiral direction producing a diamond pattern which breaks off in coarse cuttings.*

A SIMPLE, STURDY MACHINE . . . *essentially a modern loading machine on which is mounted a set of efficient cutting heads.*

HIGHLY MANEUVERABLE—FAST TRAMMING. . . *not a "muscle-bound giant" . . . it quickly follows any variation in seam thickness.*

EXCELLENT CLEAN-UP . . . *improved dual gathering arms load all the coal into a flexible rear conveyor.*

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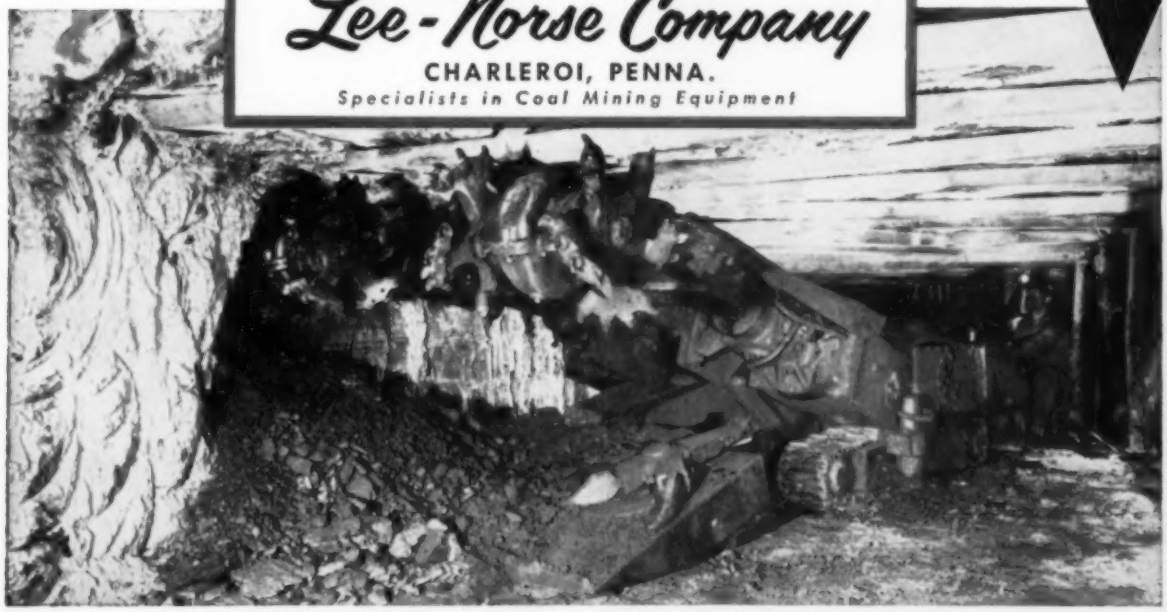
Specialists in Coal Mining Equipment



Why do more than 150 leading equipment manufacturers offer you CAT power?

Continued customer acceptance, like that expressed by K. Q. Chedester, Supt. for Dippel & Dippel Coal Co., Clairfield, Tenn., is common:

"Since repowering with Cat Engines, we've had a lot less down time. We're using ⅓ less fuel and are getting more power and quieter operation. It all adds up," concludes Supt. Chedester, "to more economical operation and lower final costs." Dippel & Dippel have standardized on Cat power for their six shovels and draglines.

Cost-conscious mining operations are capitalizing on Cat's wide range of engine models to standardize in shovels, drills, pumps, electric sets, tractors, graders, hauling units, locomotives and processing equipment.

Why this trend to Cat power in the mine field? Users have this to say:

"... *good in anything you put them in* ..."

"... *practically no down time* ..."

"... *quick starting in below-zero weather* ..."

"... *doubled the drilled footage at one-half the fuel cost* ..."

"... *overhauled previous Cat Engine once in 20,000 hours* ..."

"... *little or no down time* ..."

"... *doesn't let us down in the toughest going* ..."

"... *their economy and lack of down time spells profit —and that's why we're in business*"

"... *dealer service is very good* ..."

"... *always good performance from Cat Power Units*"

These owner statements and hundreds more like them sum up the reasons why Cat power is being offered by so many leading equipment manufacturers. So next time you invest in new equipment or need a replacement power unit, specify Cat for a better profit picture.

Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U. S. A. Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Here's one of Dippel & Dippel's recently repowered excavators. Their new power means less down time, more production and lower operating costs. "We're using ⅓ less fuel and getting more power and higher production," states Supt. Chedester. The two final excavator conversions were handled by Dippel & Dippel.

Darrel Jeffries, Stripping Foreman of Benjamin Coal Co., LaJose, Pa., has been nearly 100% Cat for a long while because of the ease of servicing and their easy starting in cold winter months. Here a Manitowoc 4500 is removing 38 ft. of overburden prior to removal of a 26-in. soft coal seam.

Here's a list of Excavator Manufacturers, alone, offering Cat diesel power:

American Hoist & Derrick Co.
Baldwin-Lima-Hamilton Corp.
Bay City Shovels, Inc.
Bucyrus-Erie Company
Byers Manufacturing Company
Dominion Engineering Works, Inc.
Fiorentini, Canada, Ltd.
Gar Wood Industries, Inc.
Hanson Clutch & Machinery Co.
Harnischfeger Corporation
Industrial Brownhoist Corporation
Insley Manufacturing Corporation
Koehring Company
Link-Belt Speeder Corporation
Little Giant Crane & Shovel Co.
Manitowoc Engineering Corp.
Marion Power Shovel Co.
Northwest Engineering Co.
Ohio Locomotive Crane Co.
Quick-Way Truck Shovel Co.
Sargent Engineering, Inc.
Sauerman Brothers, Inc.
Thew Shovel Company
Warner & Swasey (Gradall Div.)
Washington Iron Works
Wellman Engineering Co.

S. C. Monnie of Glen Campbell, Pa., uses this 2½-cu.-yd. dragline to move 250 cu. yd. of shale and clay overburden per hour. A D337 supplies power. Monnie states, "We certainly appreciate the low-cost operation and the minimum down time with Cat equipment."

BY CATERPILLAR

ENGINE DIVISION, DEPT. CA6 CATERPILLAR TRACTOR CO. PEORIA, ILLINOIS, U. S. A.

Send me more information about Cat Engines for original power and repowering.

☐ Have Caterpillar Dealer call for an appointment, as I may be in the market for a Cat Diesel Engine or Electric Set. I understand that I am under no obligation.

☐ I am interested in learning more in general about these engines.

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"25-PAK"

TWENTY-FIVE COMPLETE SETS OF FLEXCO HD BELT FASTENERS NOW AVAILABLE IN ONE EASY-TO-HANDLE ECONOMY BULK PACKAGE

There's no need now to carry several 10-set boxes to the job—every "25-PAK" contains 25 complete sets of FLEXCO Fasteners (bottom plates, top plates, clips, nuts and bolts) . . . enough FLEXCO Fasteners to join common belt widths (for example: one "25-PAK" box, size 1½E, will join a 36" belt.) Our savings from bulk-packaging are passed on to you!
Label on each "25-PAK" box has chart indicating the number of FLEXCO HD Fasteners to use for given belt widths.

Standard shipping carton contains four "25-PAK" boxes of one size fastener. Keep a supply of "25-PAKS" on hand. Easy to store and inventory, sturdy boxes and shipping cartons have many uses.

Ask your FLEXCO distributor or write to us for additional information.

Flexible
STEEL LACING COMPANY
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FOR THE SPLICE OF A LIFETIME

Utilization (*Continued*)

studying construction of a steam plant to provide peaking power to be used with hydro power. Next step is to determine the price per ton at which the coal can be obtained. Mr. Gerow will confer on this matter with officials of Northern Pacific Railway, operators of coal mines in the Roslyn-Cle Elum area.

Transportation

C&EI railroad and the Gartland Steamship Co. have entered into a joint agreement for shipment of coal from southern Illinois and Indiana to Lake ports.

This combined rail-and-water route is said to be the first one instituted between a railroad and a Lakes shipping line. The continued movement of coal will be a boon to mines in the southern parts of the two states, says David O. Mathews, C&EI president.

Railroads are beginning to request lower freight rates on coal in some areas.

An example is the decision of the Southern Railway to file for a general reduction of 45c per ton in the coal freight rate for movement into the Carolina area. In addition to the lower general rate, Southern proposes a cut of 70c per ton on volume shipments of 2,500 tons or more by one shipper to one consignee on a single day. Some roads in the northeast advocate a reduction of 65c per ton on anthracite shipments to New York. Pressure of competition from oil and gas on one hand and truck shipments on the other are behind the moves.

Accidents

After a 13-hr entrapment in a flooded mine, 24 men were rescued and brought to the surface in good physical shape.

The 24 rescued miners were trapped in a Sharples, W. Va., mine of Boone County Coal Corp. when the heavy rains of early May contributed to the collapse of a surface pond into the workings.

New Books

Engineering Graphics

Graphic Science, by T. E. French and C. J. Vierck, covers vector geometry, graphical solutions, functional scales, nomography, empirical equations and calculus. The focus throughout is on drawing as a tool for the engineer. Basic pattern of the book offers a presentation of the fundamentals of projection and projection drawing, a coverage of descriptive geometry and a discussion of graphical solutions. *758 pp; $8.50. McGraw-Hill Book Co., 330 West 42d St., New York 36, N. Y.*

Roof-Bolt Recovery

Roof-Bolt Recovery in the Middle West, by L. W. Kelly, tells how roof bolts are being salvaged for reuse at 12 mines, using hand recovery methods in four mines and machines in the others, and how they should be examined and treated before reuse. *Information Circular 7826, U. S. Bureau of Mines, Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa.*

Heating and Air Conditioning

The Heating Ventilating Air Conditioning Guide 1958 is the 36th and largest edition published. It contains new technical data made available since the previous edition. For convenient reference both the technical and catalog data sections are carefully indexed. The ASHAE psychrometric chart is included

JOE'S DOWN AND OUT

an ordinary tire quit on the job

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YOU SHOULD KNOW these great U. S. Royals have moved *millions* of tons with *no* downtime due to tire failure. Yet they cost no more. Write J. A. Watson, Mgr., Industrial Tires *now!*

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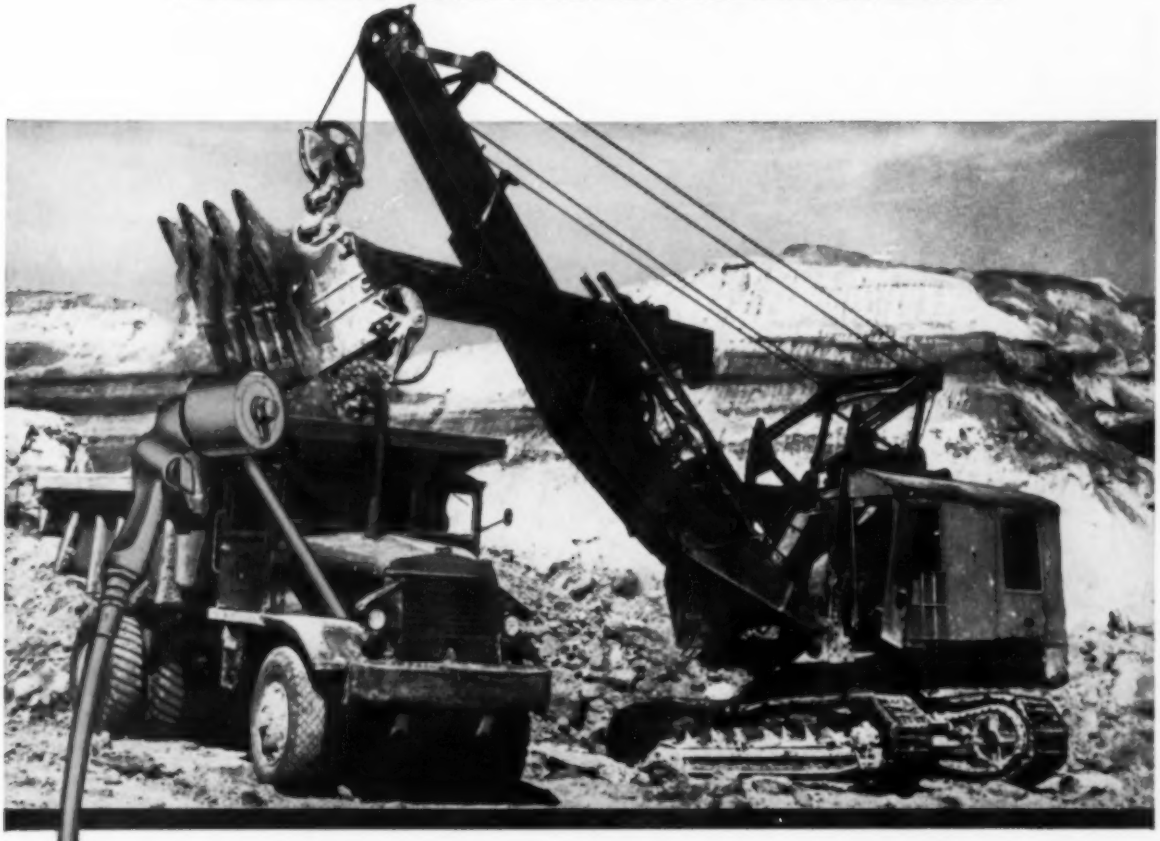

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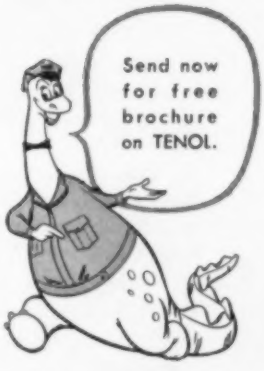
Refill now with Sinclair Super TENOL Motor Oil. Contact your local Sinclair Representative for further information, or write Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N.Y. *There's no obligation.*

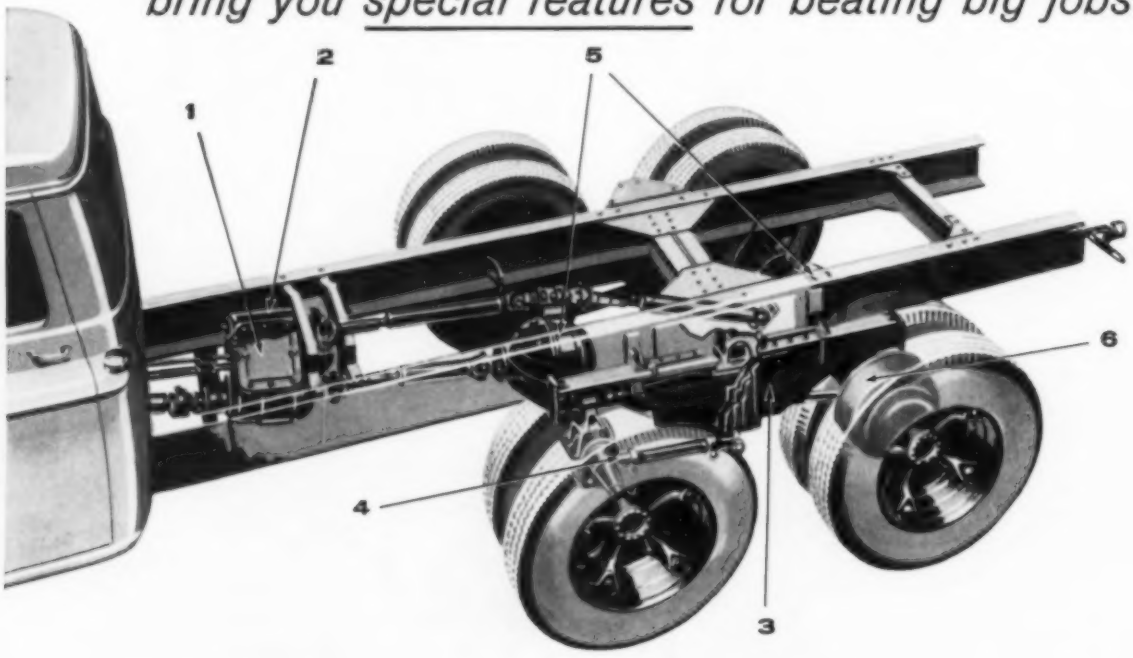
Dino, the Sinclair Dinosaur, says:



SINCLAIR SUPER TENOL

CHEVROLET'S NEW TANDEMS

bring you special features for beating big jobs!



Because of their unique features, Chevrolet's new Triple-Torque tandems are more economical to operate. They're designed to bull their way through the tough spots with tremendous traction . . . with less stress and wear on parts!

Here are some of the design advantages that make Chevrolet tandems tops on big, tough jobs:

1. Chevrolet's exclusive TRIPLE-TORQUE DRIVE is provided by individual propeller shafts driven from a 3-speed auxiliary transmission right in the power divider.

2. Integral 3-SPEED POWER DIVIDER can be shifted instantly to single axle drive for economy or dual axle drive for full traction over rugged roads.

3. The Triple-Torque tandem's articulated WALKING BEAM assures owners of greater ground clearance . . . the utmost flexibility for operation on rough terrain.

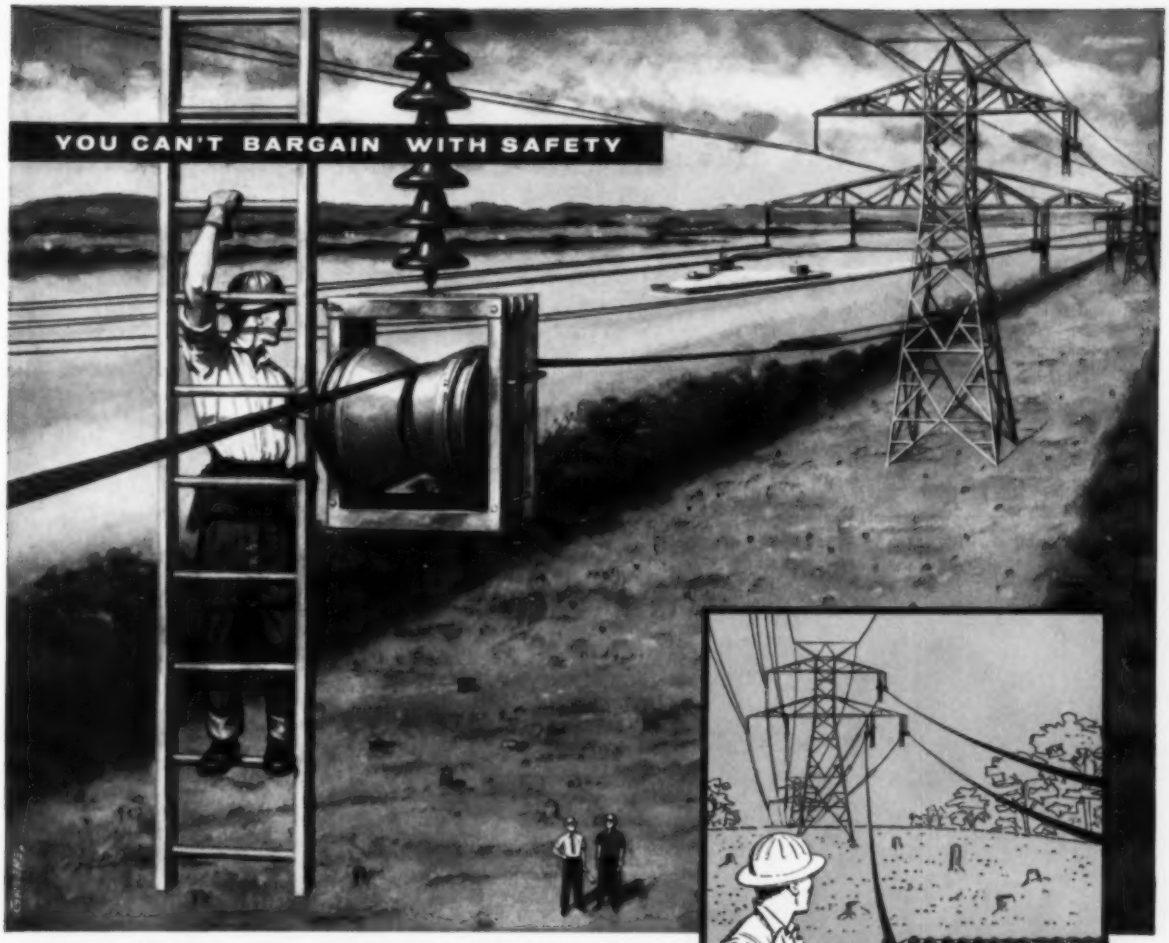
4. "TRACKING" WHEELS, because of Chevrolet's rubber-bushed steering torque rods and walking beam ends, stay in alignment on straight roads, follow curves. Increase tire life, driver control.

5. Two built-for-work 15,000-LB.-CAPACITY AXLES with 7.20 to 1 ratios! Choice of standard 7,000-lb. or extra-cost 9,000-lb.-capacity front axle.

6. BIG TWIN-ACTION BRAKES are designed to last! Extra braking power with heavy-duty Hydrovac power brake. Full-Air or Air-Hydraulic brakes optional at extra cost.

Let your Chevrolet dealer show you these, and the many more exclusive tandem features designed to get your big jobs done quickly, dependably and economically! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

CHEVROLET TASK·FORCE TRUCKS



Stringing conductors on towers carrying a live 330,000 volt circuit is a tough job. Hoosier Engineering Company of Columbus, Ohio, does it by threading conductors up to 1¾" through a tension machine and pulling them over sheaves on the tower arms with 9000 foot lengths of Wickwire Wire Rope. On jobs like this, where men's lives are at stake . . .

rope failure can be fatal

Whether you're stringing power lines, pulling drill pipe, or handling other hazardous hoisting jobs—don't bargain with safety. "Bargain" wire rope can cause more trouble and expense than you expect. Buy wire rope on the basis of *quality* . . . buy Wickwire Rope.

For extra strength—buy Wickwire's Double Gray IWRC extra improved plow steel wire rope

WICKWIRE ROPE — A CF&I PRODUCT

CF&I

LOOK FOR THE YELLOW TRIANGLE

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

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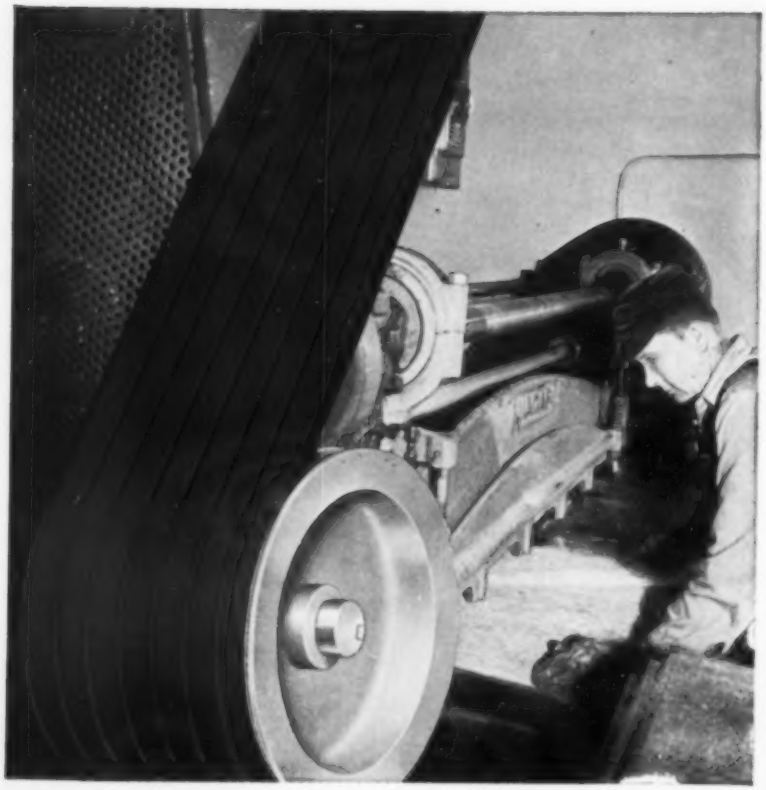

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Here's the reason:
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Make this simple test. Bend a Gates V-Belt with concave sides (Fig. 1) as if it were going around a sheave. Feel how the sides *fill out* . . . become perfectly straight (Fig. 1-A). Note how this belt makes full contact with the sides of a sheave . . . grips the sheave evenly, distributing wear uniformly across the sides of the belt. Uniform wear lengthens belt life — keeps costs down.

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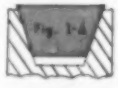
Because Gates V-Belts with concave sides are so universally preferred, they are also the *most widely available*. There are Gates distributor stocks in industrial centers throughout the world.



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Preparation Facilities

Newkirk Mining Co., Tamaqua, Pa.—Contract closed with Wilmot Engineering Co., White Haven, Pa., for installation of a new Wilmot heavy-media system to prepare run-of-mine anthracite, and for redesign of facilities in existing fine-coal plant. Feed capacity of Wilmot heavy-media system is 195 tph of Egg to Buckwheat No. 1, inclusive, and feed capacity for fine-coal cleaning facilities is 105 tph of $^{5}/_{16}$x60M raw coal.

Beaver Brook Coal Co., Beaver Brook, Pa.—Contract closed with Wilmot Engineering Co., White Haven, Pa., for one 16-ft classifier for preparing 90 tph of $^{3}/_{16}$x60M anthracite.

Pocahontas Fuel Co., Inc., Crane Creek mine, McComas, W. Va.—Contract closed with Fairmont Machinery Co., for installation of a 6-ft, 8-disc vacuum filter supplied by Denver Equipment Co.

Pocahontas Fuel Co., Inc., Boissevain colliery, Boissevain, Va.—Contract closed with Fairmont Machinery Co. for installation of a 6-ft, 8-disc vacuum filter supplied by Denver Equipment Co.

Consolidation Coal Co., Loveridge mine, Fairview, W. Va.—Contract closed with Fairmont Machinery Co. for addition of a sixth Bird filter to handle $^{3}/_{8}$x0 coal.

Cannelton Coal & Coke Co., Lady Dunn plant, Cannelton, W. Va.—Installation by Kanawha Mfg. Co. of Wemco Fagergren fine-coal flotation equipment for recovering minus 28-mesh fine coal from circulating water at a feed rate of 25 tph, and installation of an 8-ft 10-in, 9-disc Agidisc coal-type filter complete with auxiliaries. Probable date of completion, September, 1958.

Hanna Coal Co. Div., Consolidation Coal Co., Georgetown plant, Cadiz, Ohio—Contract closed with Western Machinery Co. for additional Wemco Fagergren flotation equipment for recovery of fine coal (75% minus 200-mesh) to a total feed capacity of 40 tph. Completion, June or July, 1958.

Badgett Mine Stripping Corp., Shamrock mine, Providence, Ky.—Contract closed with Jeffrey Mfg. Co. for one 7-ft, 2-compt., 5-cell Baum jig and one

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OF
AMERICA'S
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FIELDS

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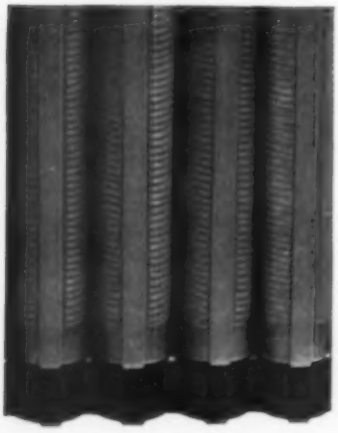
Today's Exide-Ironclad features improved tubular construction, making it even better than the models that chalked up the industry's records. So you can expect even longer life potential and superior performance.

Total work output, not mere price, is the key to battery economy. When you buy batteries, specify Exide-Ironclad and get the most production capacity your dollar can buy. For details, write Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.



High-capacity, long-life tubular construction. Gives positive plate one-third more surface area for greater power reserve. Power tubes hold active material securely for long battery life.

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Prep. Facilities *(Continued)*

2-compt. diaphragm jig for 500 tph of 6x0 coal.

Pocahontas Red Ash Mining Co., Iaeger, W. Va.—Contract closed with Jeffrey Mfg. Co. for No. 100 Unit Washery for 50 tph of 3x¾-in coal.

Cambridge Smokeless Coal Co., Bluefield, W. Va.—Contract closed with Jeffrey Mfg. Co. for 2-compt. diaphragm jig and No. 200 Unit Washery settling tank and conveyor to handle 160 tph of 3½x¼-in coal from Jewell seam.

Equipment Approvals

Equipment Approvals

Ten approvals were issued during April.

Goodman Mfg. Co.—Type 966C loader; four motors, each 20 hp, 500 V, 50 cycles, AC. Approval 2-1348A, April 2.

Goodman Mfg. Co.—Type 584-20 shuttle car (right hand); three motors, two 20 hp and one 10 hp, 440 V, AC. Approval 2-1349A, April 3.

Joy Mfg. Co.—Type 6SC7PH/XH3 shuttle car; three motors, two 20 hp and one 15 hp, 440 V, AC. Approval 2-1350A, April 3.

Goodman Mfg. Co.—Type 584-21 shuttle car (left hand); three motors, two 20 hp and one 10 hp, 440 V, AC. Approval 2-1351A, April 3.

Lee-Norse Co.—Model LCM28-1K miner; two motors, each 50 hp, 250 V, DC. Approval 2-1352, April 7.

Baltimore Instrument Co.—Stratoscope, 6 V, DC. Approval 1029, April 17.

Joy Mfg. Co.—Type X-849-35 conveyor belt drive unit; one motor, 25 hp, 500 V, DC. Approval 2-1353A, April 21.

Jeffrey Mfg. Co.—Type ML81AH loading machine; five motors, four 15 hp and one 4 hp, 250 V, DC. Approval 2-1354, April 22.

Ensign Electric and Mfg. Co.—Type Single G distribution box; one 100 amp circuit breaker, 440 V, AC. Approval 2-1355A, April 29.

Acme Machinery Co.—Type 275A4-JR compressor; one motor, 60 hp, 230 V, DC. Approval 2-1356, April 29.

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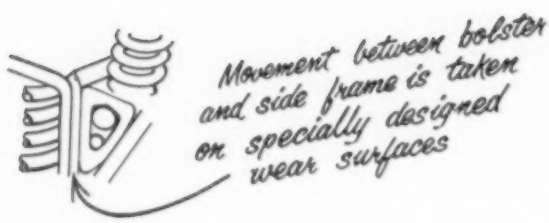
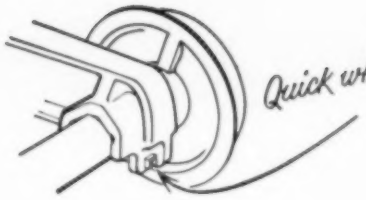
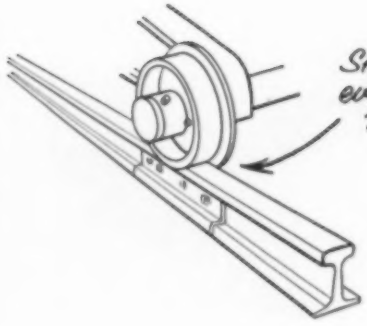
Wire Rope



Movement between bolster and side frame is taken on specially designed wear surfaces

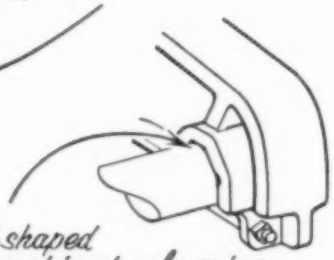


Quick wheel change

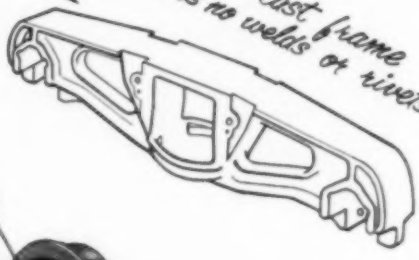


Smoother ride even on rough tracks

Large center bearing for longer life



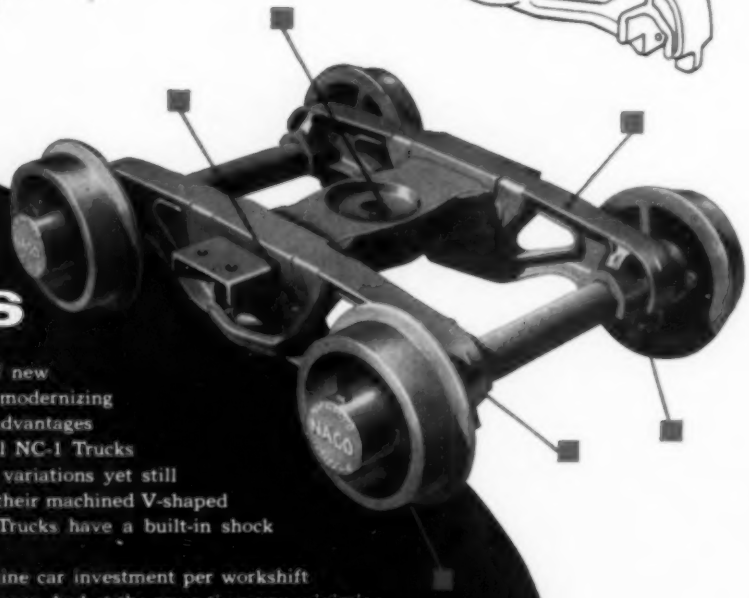
V-shaped machined axle grips for controlled flexibility and truck alignment



Integral cast frame has no welds or rivets

Check these "plus" features

OF NATIONAL NC-1 TRUCKS



If you're considering the purchase of new 8-wheel mine cars . . . or if you're thinking of modernizing older cars—*now* is the time to check the advantages of National NC-1 Trucks. National NC-1 Trucks have controlled flexibility for track variations yet still maintain truck alignment through their machined V-shaped axle grips. In addition, NC-1 Trucks have a built-in shock absorbing mechanism.

You get more out of your mine car investment per workshift . . . per day . . . per year. And at the same time you minimize spillage . . . get greater protection for your equipment, track and structures . . . slash maintenance to a new low.

Yes, *now* is the time to check National NC-1 Trucks—they make sense for 8-wheel mine cars . . . *make dollars for operators*, too.

- WILLISON AUTOMATIC COUPLERS
- RUBBER CUSHIONED UNITS
- NC-1 CAR TRUCKS • NACO STEEL WHEELS
- NACO STEEL LINKS & SWIVEL HITCHINGS

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NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Established 1868 — *Cleveland 6, Ohio*

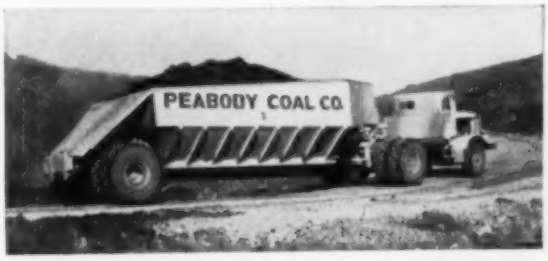
10 big "Euc" Coal Haulers at new Peabody Mine

At its River King Mine in Illinois, Peabody Coal Co. has ten of these 47-ton Bottom-Dump Coal Haulers. Powered by a 335 h.p. engine with 9-speed transmission, these "Eucs" haul their big loads from pit to preparation plant at speeds up to 34 mph. They average 16 trips per day on a 4 mile haul from shovel to plant and return.

Because they're engineered and built for heavy off-the-highway service, "Euc" Coal Haulers stay on the job longer, with less time out for repairs and maintenance. Their high job availability, combined with big capacity and fast travel speeds, pays off in more tons per shift. That means lower hauling costs and more profits.

Your Euclid dealer will be glad to provide a production cost estimate for your operation. He can probably show you how to cut your hauling costs and improve your profit picture . . . ask him for proof that Euclids are your best investment.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio



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FOR MOVING EARTH, ROCK, COAL AND ORE

Performance-Proven

that's the Success Story of ROCKBESTOS A.V.C. Motor Lead Cable

standard equipment for heavy-duty mining machinery motors.

Today hundreds and hundreds of motors in heavy-duty mine machinery give continuous trouble-free performance, thanks to Rockbestos A.V.C. Motor Lead Cable.

This Rockbestos cable was designed for use where oil and grease resistance is important, where protection against high ambient temperatures, starting overloads and other operating tortures is of prime importance. And Rockbestos A.V.C. Motor Lead Cable is standard equipment in motors used by leading mining machinery manufacturers such as Goodman, Jeffrey, and Joy.

This Rockbestos cable is also performance-proven in mill motors and other heavy-duty stationary and traction-type motors.

You, too, can get trouble-free wire performance in your motors by specifying and using Rockbestos A.V.C. Motor Lead and Apparatus Cable. It keeps flexibility indefinitely — won't bloom or rot, when exposed to grease — won't burn or carry flame.

Be sure to get this quality cable — specify Table ML, Rockbestos A.V.C.

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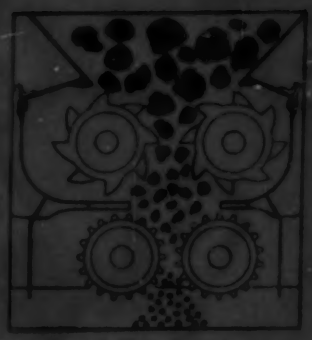
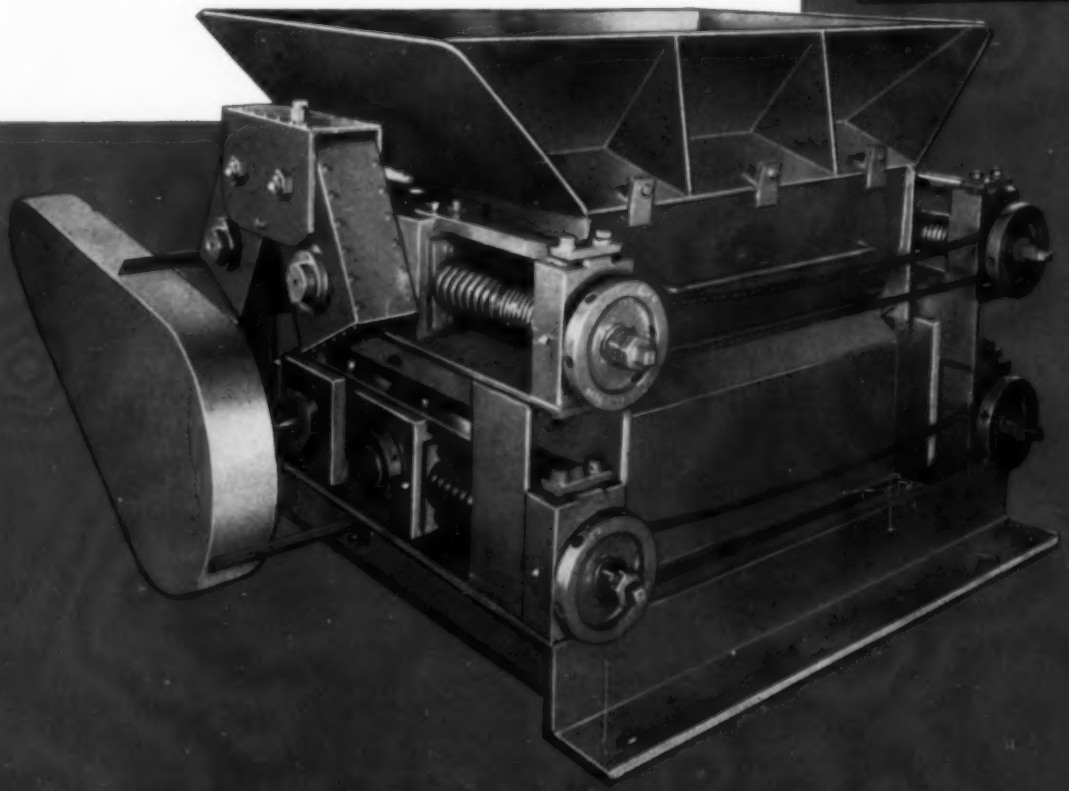
PRODUCTS CORP. • NEW HAVEN 4, CONN.
NEW YORK, CLEVELAND, CHICAGO, PITTSBURGH, LOS ANGELES, DETROIT, ST. LOUIS, NEW ORLEANS, OAKLAND, SEATTLE

Meet the Press in a
GUNDLACH CRUSHER

Meet the press of today's market where absolute control of top size is essential





The Gundlach two-stage double adjustable crusher is designed to meet the exacting demands of today's market in that it is capable of crushing to any desired top size from ½" to 6". The resultant crushed product is uniform in size, with definite control of top size, and has a smaller percentage of fines than any other crusher on the market.

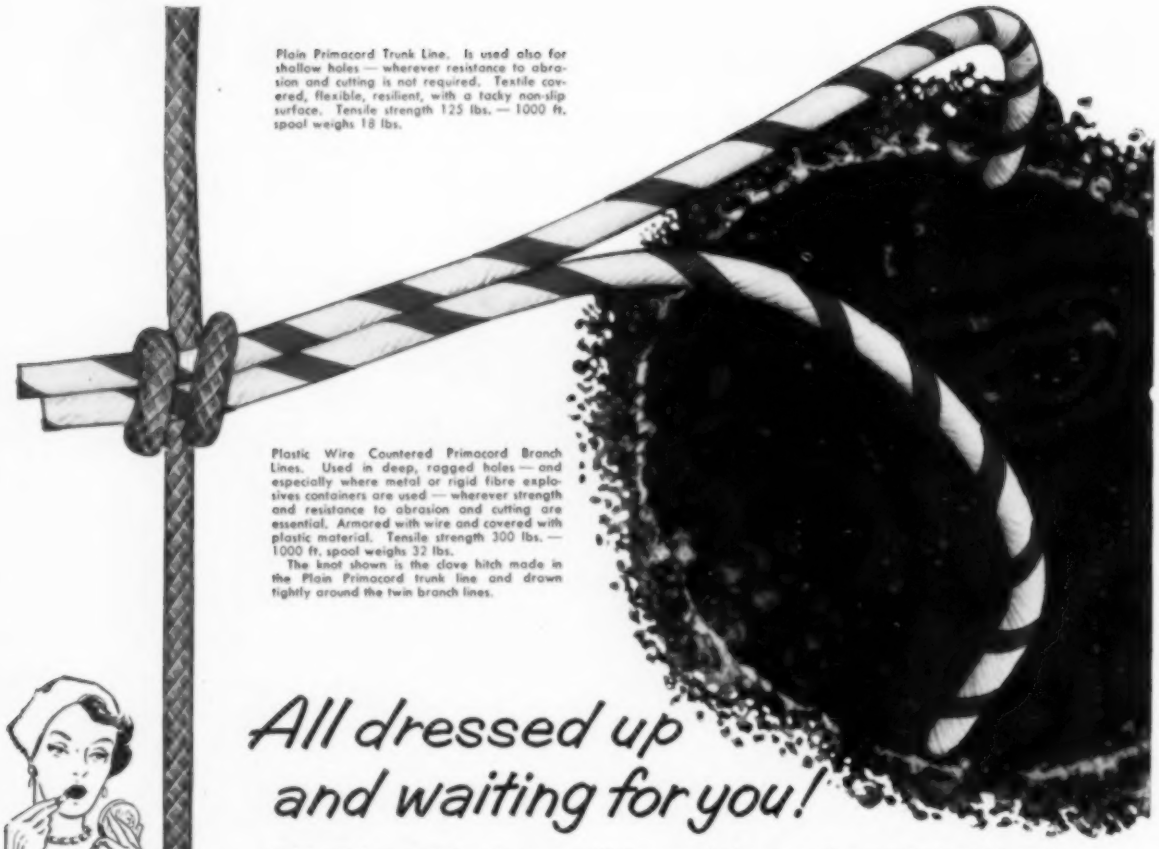
Primary and secondary crushing in one operation eliminates additional crushing and conveying equipment. Compactness in design saves valuable installation space. Quality controlled production eliminates unwarranted use of horsepower.

Both upper and lower rolls are adjustable by mere turn of hand wheel (even while crusher is in operation), to compensate for variance in size of feed and desired size of end product. Product to be crushed is fed to crusher where the heavy hook-design tooth-studded upper rolls perform the primary crushing operation. Simultaneously the patented pocket-tooth designed lower rolls grab and reduce the pre-crushed product to the desired top size with a minimum of grinding action.

T. J. GUNDLACH MACHINE CO.

DIVISION OF T-N-T INDUSTRIES, INC.

P.O. Box 883 • Belleville, Illinois



Plain Primacord Trunk Line. Is used also for shallow holes — wherever resistance to abrasion and cutting is not required. Textile covered, flexible, resilient, with a tacky non-slip surface. Tensile strength 125 lbs. — 1000 ft. spool weighs 18 lbs.

Plastic Wire Countered Primacord Branch Lines. Used in deep, ragged holes — and especially where metal or rigid fibre explosives containers are used — wherever strength and resistance to abrasion and cutting are essential. Armored with wire and covered with plastic material. Tensile strength 300 lbs. — 1000 ft. spool weighs 32 lbs.

The knot shown is the clove hitch made in the Plain Primacord trunk line and drawn tightly around the twin branch lines.

All dressed up and waiting for you!

This Primacord hook-up could be one hole or a thousand, loaded and primed. But it's not ready to "go" until you attach the fuse and cap or electric blasting cap onto one end of your Primacord trunk line.

This is because Primacord, the proved and approved detonating fuse, *must be detonated* before it can send its explosive wave into your primers or directly into your explosives charges.

The danger of premature shots is reduced to a minimum because Primacord cannot be set off by normal vibration or friction, ordinary impact or sparks, or stray electrical currents. Even a direct hit by lightning failed to detonate it.

When it goes, you'll get a blast you can be proud of!

For further information see your explosives supplier or write to

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Primacord® and Detacord® Detonating Fuse, Safety Fuse, Ignitacord®, Quarrycord®, Pyrotechnical Devices and Blasting Accessories

Hook-up and detonate with

PRIMACORD®

and guard against *Stray Current* hazards

The square knot is used only above ground, to lengthen a trunk line of Plain or Reinforced Primacord, or to tie in Primacord M S Connectors. It must be drawn up tight.

P-d

Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

COAL AGE

JUNE 1958

IVAN A. GIVEN, EDITOR

Uses and Values

THE USES OF RESEARCH are almost infinite. This stems from the fact that research takes many forms and has many goals. It may be individual—the product of one organization's ideas or efforts—or it may be cooperative—a number of companies or an entire industry. It may be practical—the development of a product or a method that can be put to immediate use, as a packaged boiler unit—or it may be basic—a thoroughgoing study, for example, of what makes up coal as a foundation for taking it apart and making it into something that will expand its service and profit possibilities.

Markets

As noted, the uses of research are almost infinite. One of its most useful forms is the study of consumer desires and needs and market possibilities, commonly called market or commercial research. Research does not only uncover facts and ideas about the industry's or organization's own product. Properly done, it shows the strengths and weaknesses of competitive products, and thus permits the development of the soundest sales and service approach. No sales program can be counted as 100% successful that is not based on a careful count not only of present customers, but all possible prospects, in addition to the careful canvass of consumer desires and needs in relation to the merits of the product.

Methods

Cost, quality and suitability to the application are admittedly major considerations in determining the ultimate market position of a product. Coal is no exception. So methods and equipment in mining and preparation take their proper—and vital—places in the picture. Here again, someone has to conceive the idea, carry out the experiments and develop the final product, whether it is an extensible belt, a shothole loader, a method of cementing roof to increase its strength, or plastic curtains with clear window sections for use on shuttle-car runs. This process also is research in one of its almost infinite forms, and like all others can be made to pay off in a big way.

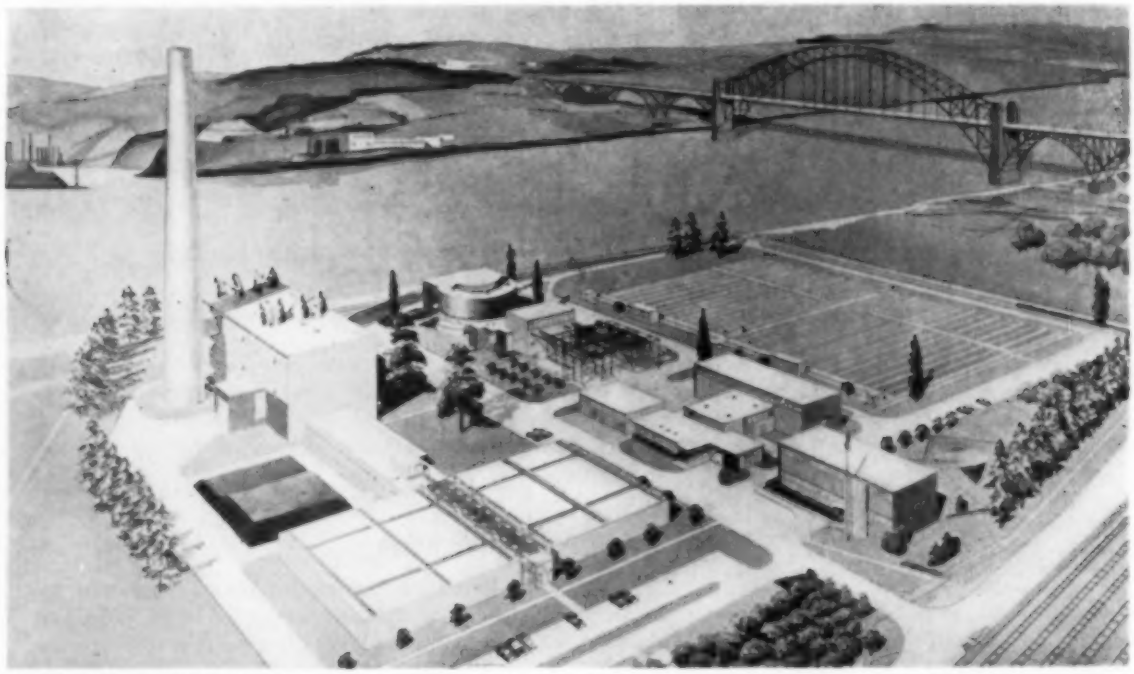
Application

Even though research takes many other forms, some of which have been listed in the preceding paragraphs, it is most often thought of as a means of expanding existing markets or developing new ones by creating new uses for the product. There is no question but that this is one of research's major roles, whether the end product is a new piece of equipment in which the product can be used more efficiently, a new application resulting from a basic study of the product, or some development in between. The laboratory, backed up by a sales, service and production machine tuned to its finest pitch by research in these fields also, is the surest means of capitalizing on all possible market opportunities.

Values

Coal has come a long way in all forms of research in recent years, and in addition to its own programs is actively seconding the idea of parallel and supplementary research by other agencies, including the federal government, for the good of people as a whole. This reflects growing appreciation of the role research, with all its ramifications, can play in the acceleration of progress. This growing appreciation for the values of research also is finding expression in coal's expansion of its own programs. The new BCR central laboratory is the latest and most-exciting example of that expansion. But it means that coal must be prepared to increase its support and participation. When the rewards are balanced against the cost of that support, the conclusion is clear. Research assures more values today—and tomorrow.

Behind the Acid-Waste Drive: The Narrowing Scope of Ohio Valley Stream Pollution . . .



MUNICIPAL SEWAGE FACILITIES are in operation now or under construction to serve 86% of the Ohio River's main-stem population—compared to less than 1% in 1948. Huge Pittsburgh sewage-treatment plant (above) is due on the line next year.

Acid Drainage Controls Coming

Handwriting on the Wall...

Coal Age, August, 1955, p 54

LOOK FOR STRICTER REGULATION of the discharge of water and wastes from coal mines and preparation plants into the streams of the United States. Mine operators have a real stake in anticipating this development. Aside from minimizing or eliminating suits and punitive action, industry participation in sound pollution controls is the best assurance that it will not be saddled with unwise and costly legislation. In addition, coal stands to benefit not only from savings in replacement of corroded pipe, pumps and other equipment, and in the recovery of salable coal from preparation-plant discharges, but also from its standing with the public. Positive identification with a sound program aimed at minimizing the discharge of acid, sludge and slurry into streams would be no little public relations achievement.

That stronger curbs on coal wastes are coming is reflected in the water pollution-control movement fast taking hold of the country . . .

ORSANCO Resolution, Jan. 15, 1958:

WHEREAS: The control of mine drainage constitutes one of the important necessities in safeguarding water quality in the Ohio River; and

WHEREAS: There are practical methods available that have demonstrated effectiveness for the control of mine drainage and acid discharges as evidenced by the report of the subcommittee on mine drainage of the Engineering Committee;

NOW, THEREFORE, be it resolved that the Engineering Committee make the following recommendations to the commission:

1. That the executive director prepare a draft of a regulation for the control of mine drainage to be submitted to the commission for referral to the Engineering Committee and the Coal Industry Advisory Committee; and

2. That the executive director be authorized to request through the state water-pollution-control agencies of the compact states opinions from their attorneys-general defining the responsibility for drainage from abandoned mines.

MOST INDUSTRIAL PLANTS using valley streams now comply with pollution-control rules. Example: Christopher Coal's cleaning plant (above), Osage, W. Va.

All evidence points to the introduction of acid mine-drainage controls in the Ohio River Valley. Needed most to avoid punitive legislation: Maximum industry-wide effort NOW to curb all stream-polluting wastes. Proposed: a producers' committee and action program.

By **W. A. Raleigh Jr.**
Associate Editor, *Coal Age*

TIME IS RUNNING SHORT in coal's battle to solve its most difficult stream pollution problem—acid mine-drainage control. And here's why: a crackdown is coming which may bring rules and regulations before satisfactory, well-defined solutions are available.

Latest evidence of the coming crackdown is the Jan. 15 resolution (p 72) of the Ohio River Valley Water Sanitation Commission. ORSANCO is an eight-state agency dedicated by Congress-approved compact to control pollution in the waters of the Ohio River Valley. The states include Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia.

Boiled down, ORSANCO's resolution means more pressure will be put on coal companies for wider use of existing acid-abatement techniques. It should also bring an accelerated research effort for new and improved ways to solve a problem which so far has escaped a panacea solution. Such lines of action were clearly indicated in ORSANCO's 1957 annual report:

"There is reason to believe that a wider application of such practical measures as mine sealing, controlled discharge of drainage and the prevention of seepage would result in demonstrable reduction of acid in streams. It is within this area of appraisal, in addition to possible sponsorship of basic research, that the commission hopes to stimulate action.

Although more aggressive action on mine-drainage control may be justified, expert opinion suggests that an ironic situation might develop. If rules and regulations are adopted prematurely, they could be punitive to coal and put ORSANCO in the untenable position of imposing controls which would hamper rather than accelerate final solutions.

ORSANCO'S Move: The Motives

A major factor behind ORSANCO's move is aroused public opinion. However uneducated this force may be in the complexities of acid-drainage control, it is mounting to an action-demanding pitch.

Aroused public opinion stems from increasing awareness that adequate water resources cannot be taken for granted in an economy faced with constant population growth and long-range industrial expansion.

Aroused public opinion also stems from taxpayers' reluctance to accept the cost of municipal sewage treatment plants and then find that some industrial offenders still pollute streams with wastes which degrade quality for water supply and recreational purposes.

Not to be underestimated either are the fishing enthusiasts who band together in highly vocal groups and clamor for action where action often is not feasible or economically justifiable.

A second major factor behind ORSANCO's Jan. 15 resolution is apparent lack of positive pollution-control action by coal. The inertia takes two forms.

1. Because of historic indifference, adamant objection to cost, or both, a minority of recalcitrants continue to avoid taking any action to curb acid drainage where existing control methods might be practical and effective.

2. Also, because available data on existing control techniques has not been adequately assessed and disseminated, the majority of responsible operators may not be doing as much as they could—either in current practice or in supporting research for improved methods in the future.

Increasing recognition of these facts has caused informed observers to

Pollution Control Tops Nation's Water Agenda

CONGRESS is the focal point of local and state public opinion across the Nation. When this opinion reaches forceful, mass proportions, federal actions result. Judged on these premises, a special report by the McGraw-Hill Washington Bureau shows that water-pollution control has taken top spot on the Nation's water-development agenda. The report follows:

In the last 2 yr, national policy on water-pollution control has firmed up much more than any other phase of water-resources development. The 1956 Water Pollution Control Act not only provided financial aid to state and local agencies in building waste-treatment plants. It also permits the federal government to enforce reasonable pollution standards when a downstream state complains about the quality of water flowing into it from an upstream state. No other piece of national water legislation grants similar enforcement power to a federal agency.

The enforcement provision applies to acid waste as much as to any other contaminant flowing across state lines. The law is designed to settle differences between states amicably, without going to court. A number of disputes have been resolved by conferences which the law specifies as the first step in the enforcement procedure.

Under the powers delegated to him, the Surgeon General, heading the United States Public Health Service, has held conferences in six cases that were successfully settled by this process. Main purposes of the conferences are:

1. To determine if pollution affects the health or welfare of a complainant state.

2. To establish a time schedule for correction of the offensive pollution.

Later, if the offender state does not take reasonable action to follow the correction schedule, the Surgeon General can call a public hearing. This hearing is the second preliminary step required by the law before a state can carry its case to court.

No first-step conference was stipulated under the 1948 Act which called only for a public hearing. Because of its weak enforcement language, requiring the consent of the offender state before any action could be taken, the old law was invoked only once.

The stronger law now on the books gives the whole national program of pollution control a new lease on life. In its own Cincinnati laboratories and through research projects in other places, USPHS is pushing investigation of many phases of pollution—both causes and correctives. The agency is now thinking of putting some of this research effort into acid-mine drainage. One aim is to obtain field data on acid loads in streams; another is to explore further the merits of preventive measures, compared with the possibility of finding feasible and effective inhibitors for use at the mine or other source.

NATIONAL AND STATE EFFORTS RELATED—USPHS efforts are only one part of a noticeable rebirth of interest in the problem of acid-mine wastes during the last 6 mo. Last November at Columbus, Ohio, a water-pollution-control symposium raised the curtain on a revived attempt to find workable solutions (*Coal Age*, January, 1958, p 42). For its spring meeting at Bedford, Pa., May 8 and 9, The Interstate Commission on the Potomac River Basin chose the theme: "We Can Control Acid Mine Wastes." These developments—plus the announced intention of the Ohio River Valley Water Sanitation Commission to seek enforcement of standards—are strong indicators of the reawakening of interest. The mine waste problem has also attracted the attention of the U. S. Securities and Exchange Commission.

Pennsylvania has been a leader in developing rules. Its experimental regulations for operating and maintaining strip mines, as amended in September, 1952, are an example. At present, these rules are truly experimental. The Mine Waste Div. of the State Department of Health, which has been working for years on the problem, has not yet determined that the regulations are practical from a cost standpoint.

But L. S. Morgan, division chief, and his small staff have had good cooperation from mine owners and operators. Solid cooperation is readily given, of course, on ideas that really save money. An example is reducing pumpage by sealing water out of the mines. Another example is to open portals by a new method that permits sealing them tight against surface drainage when the adit is abandoned. Also, in strip mining, drainage into streams often can be prevented by the simple process of hedge-hopping water courses during the stripping operation.

Following studies and observations, Mr. Morgan suggests that the growth of the total mine acid load has been arrested, if not reversed, in his state. He mentions these contributing influences: the WPA mine-sealing program of 1933-40; increased strip mining; construction of equalizing reservoirs; and limited regulatory programs.

In one recent study, Mr. Morgan's staff sampled water in the Allegheny River opposite Pittsburgh's Aspinwall water treatment plant. The study showed that acid concentration was slightly less than when similar samples were taken by USPHS during the Ohio River survey of 1940.

This change in acid load at Aspinwall—in the north branch of the Potomac and at other points—makes it imperative, USPHS officials believe, that the old Ohio River survey data be brought up to date. Speakers at last November's symposium (Columbus, Ohio) were still quoting 1940 figures as the latest data available on acid mine-waste concentration.

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take a new look at the acid mine-drainage problem. On the one hand, they doubt that there ever will be a panacea solution. On the other hand, they see clear opportunities for wider use and improvement of present control measures. Typical comments within the past year or so include the following.

Prof. E. Q. Moulton, chief, Ohio State University acid mine-drainage research team (in substance):

Too many of those involved in the acid mine-drainage problem are looking for a panacea when, in fact, no one control method will apply to all acid-producing situations. One of the most pressing needs is for more use of information now available on control techniques and better classification of mines in terms of abatement procedures (OSU acid mine-drainage conference, November, 1957).

E. J. Cleary, ORSANCO executive director and chief engineer:

"Many of us are convinced that the efforts to minimize acid discharges

have not kept pace with the possibilities for so doing. Demonstrations of some successful results in at least three of our signatory states (Pennsylvania, Ohio and Indiana) should at least dispel the spirit of defeatism that has been so universally preached with regard to this problem" (ORSANCO meeting, January, 1958).

Henry Hebley, research consultant, Pittsburgh Consolidation Coal Co. and chairman, ORSANCO Coal Industry Advisory Committee:

"The study of this problem has been going on for years and a number of practical suggestions have been made that, if carried out, would alleviate the situation. However, they must be put into practice by the operating departments of coal companies" (*Mining Congress Journal*, August, 1957).

A third major factor behind ORSANCO's Jan. 15 resolution is the narrowing scope of Ohio River Valley stream pollution.

The "foot-dragging" tactics of some industrial plants now stand out like a sore thumb in the commission's 10-yr record of achievement in cleaning up the Ohio River and its tributaries. This record shows:

1. That municipal sewage facilities are in operation now or under construction to serve 86% of the total population on the main stem of the Ohio River—compared to less than 1% in 1948.

2. That "more than two-thirds of the industrial plants discharging effluents into streams of the valley now comply with commission minimum requirements for pollution control."

ORSANCO'S MOVE: The Probable Outcome

What then will be the combined effect of aroused public opinion, apparent lack of positive pollution-control action by coal and the narrowing scope of Ohio River Valley stream polution?

Some observers fear that ORSANCO and other enforcement bodies may stampede coal into adopting rules and regulations for acid mine-drainage control before solutions are available.

But more probable is this procedure and outcome. ORSANCO's Coal Industry Advisory Committee—organized by invitation of the commission 6 yr ago—has been requested to cooperate with ORSANCO's staff in executing the commission's mandate to prepare a draft of control measures. Thus, through suggestions made by its representatives on the CIAC, the coal industry in the Ohio Valley will have a voice in setting the pattern for an action program.

Don't be misled into thinking that industry cooperation in setting the pattern for action indicates any pussyfoot attitude on ORSANCO's part. On the contrary, industry participation has been fostered by the commission in all its actions leading up to hard-and-fast rules. This approach is borne out in two other industry cases more advanced in the procedure:

1. The chemical industry is already faced with the prospect of hard-and-fast rules in curbing the indiscriminate discharge of chloride wastes.

2. The oil industry has just completed its review of a commission-staff regulatory proposal.

Following in the wake of these two industries, coal has now been requested to push maximum implementation of acid-abatement measures.

Maximum implementation does not mean that ORSANCO expects the impossible. This tack is unlikely because the CIAC has the commission well educated on the complexities of the acid mine-drainage problem. But ORSANCO does look for wider application of existing palliative measures. Also looked for is an improved attitude—one that shows movement away from a defeatist philosophy which has bogged at least part of the industry down in a mire of confusion and inaction.

Action Program

Broadly, an improved attitude might be reflected in adopting an industry-wide program which would:

1. Aim to level off the rate of increasing stream pollution from present mine and preparation-plant operations.

2. Strive for better control of waste drainage from abandoned workings.

3. Specifically, this program might include such actions as the following:

In strip mining—Seek licensing systems that would deny new permits to "fly-by-night" operators whose past records show they have evaded control measures now practiced virtually across-the-board (Pennsylvania already has such a system and it has been eminently successful).

In underground mining—Broaden efforts to assess known and experimental acid-control techniques for possible applications.

In handling gob piles—Take more care in fitting accepted practices to local conditions and explore new methods.

In abandoned mines—Work continuously with enforcement bodies to fix pollution-control responsibility.

In new properties—Survey existing waste drainage before starting operations and file reports with pollution-control officials.

In state inspection services—Campaign for higher pay scales that will attract engineers qualified to evaluate mine-drainage situations.

In public relations—Undertake to educate enforcement officials and the general public (1) on the facts about acid mine drainage, and (2) on what coal is doing to accept its share of responsibility for control.

In research—(1) Prepare an operator's reference manual classifying mines and geologic conditions in terms of possible acid-abatement procedures and (2) set up a coordinated program to expedite completion of present studies and field experiments.

Complexities of the Problem

An action program like the preceding—administered aggressively on an industry-wide basis—would give coal the best possible insurance against punitive or arbitrary legislation. It would also set the stage and climate for coming up with satisfactory, well-defined solutions to a problem which has been vastly complicated by numerous factors. Among these are the following:

1. Acid mine drainage is a natural phenomenon not subject to uniform controls possible with most man-made industrial wastes.

2. It is difficult to fix responsibility for sealing abandoned mines which account for 60 to 90% of total acid pollution.

3. Due to differing geologic conditions, acid occurrence varies widely in regional and local coal-producing areas—even in adjacent mines working the same seam.

4. The rate of discharge of acid mine water varies from hour to hour and from day to day. Whatever the ebb and flow, however, the acidity of

the effluent remains practically constant.

5. There is no relationship between the sulphur content of saleable coal and acid formation. Instead, acid formation results from compounds found mostly in roof strata, boney and partings.

6. Impounded acid mine water overflows following heavy rains.

7. Standards vary as to acceptable acidity or alkalinity of stream waters.

8. There are no fixed standards for preparation-plant performance.

9. Removal of pollution-causing wastes from plant effluent is costly.

10. Little progress has been made to prepare an operator's reference guide which digests for practical usage the huge backlog of data on acid mine-drainage. But a great amount of useful information has been developed by Mellon Institute for the Coal Industry. And one publication, for example, lists some 538 references on the subject ("The Acid Mine-Drainage Problem in Ohio," Ohio State University, November, 1957).

Acid-Drainage Control: Present Practice

In spite of the numerous factors which complicate final solutions to the acid-pollution enigma, there is no denying that certain preventive measures can be practiced more widely. *Coal Age* [August, 1955, p 56] pointed to 21 of these as they apply to active strip, deep and auger mines; abandoned mines; preparation plants; and "casual" standing pools. The measures boil down to four main lines of action: keep water out, keep drainage moving, segregate sulphuritic materials, and neutralize acids in preparation-plant effluent and in "casual" standing pools.

It would be presumptuous to attempt to analyze and document possible applications of these basic concepts to all geologic and mining areas. This is a huge job in itself, better reserved for the industry's research agenda. In the case of the individual mine, possible applications might better be pursued by a chemical engineer or pollution-control specialist.

In order, however, is some broad picture of the present status of acid-drainage knowledge and practice. This picture has been provided in a memorandum prepared last February by Ernst P. Hall and Henry F. Hebley, research consultants, Pittsburgh Consolidation Coal Co. Excerpts from their memorandum follow:

Sources and Formation—Acid waters from coal mining are derived principally from five sources; abandoned mines, protective pumping, active underground mines, refuse dumps or gob piles, and strip mines.

It has been conclusively shown that iron sulphide in the form of pyrite or marcasite is the primary origin of sulphuric acid from coal. These minerals are oxidized by atmospheric oxygen (with or without an assist from bacterial oxidation) to produce sulphuric acid. This acid is picked up by percolating waters and carried out of the mine.

Other minerals associated with or near the coal may be dissolved in these percolating waters causing some or even all of the acid to be neutralized before leaving the mine area. Worth noting: All mine drainage waters are not acid and the acidity at each drainage point may vary greatly because of the peculiar geologic and hydrologic conditions involved.

If the natural cycle of oxidation and transport is broken at any point, the problem of stream pollution by acid mine water would cease to exist. But this oversimplified statement of fundamentals is complicated almost beyond imagination with this result: Satisfactory solutions have not been found except in a few situations.

Abandoned Mines—Various estimates have placed the acid discharge from these mines at 60 to 90% of the total acid discharged from all coal mines. This results from the cumulative effect of continued acid production after all coal is extracted.

Mine-sealing programs have been extensively tried to mitigate this drainage problem. Other ideas such as contact antioxidants have also been tested. But none of these schemes have proven successful or even shown real promise of being successful except in isolated cases. Tests show that the oxygen content inside many sealed mines is only slightly lower than before sealing. The apparent reason: Sealed mines have a fractured and porous cover which permits enough oxygen supply for continued acid formation.

Flooding an abandoned mine completely, thus sealing off oxygen from the sulphide minerals, seems to be quite successful in preventing acid formation and, thus, stream-acid pollution. The procedure, however, is limited by both legal and physical restrictions. Physically, for example, a large percentage of mines are above the water level and cannot, therefore, be held full of water.

Protective Pumping—It is frequently necessary to pump drainage water from abandoned workings to prevent flooding of an adjacent, active underground mine. Additionally, some mining regulations require that water pressure be relieved from headers to protect active mining areas. These restrictions prevent acid control by flooding and demand that the acid-laden water inside the worked-out-mine area be pumped away.

Recent unpublished data, compiled by the Mine Acid Control Fellowship at Mellon Institute, indicates that continuous pumping of these abandoned areas with maximum water removal may, in some cases, materially reduce the acid load from the area.

Continuous discharge of acid mine water has the added advantage of eliminating "slugging" of the waterway into which it is pumped. This provides the maximum opportunity for neutralization and assimilation of the acid load by the watercourse into which it is discharged. Similar protection against "slugging" could be available if regulations and terrain permitted storage of the acid waters for release during high-water flows.

Active Underground Mines—Water is cleared from most underground mines by a combination of natural drainage and pumps which convey it into a large central sump. From here the water is pumped occasionally (as required) through a borehole to the surface for discharge into a nearby stream. Both the underground drainage-pump system and intermittent pumping from a central sump afford maximum opportunity for acid formation.

Recently, unpublished experimental work has been in progress to find a solution to this situation through modified methods of water handling within the mine. One such experiment has been in progress under the direction of the Mellon Institute for 18 mo and is continuing [*Coal Age*, March, 1957, p 68]. Results to date are encourag-

ing. However, it may require 5 yr or more to develop reasonably good technical data for estimating its final outcome. The experimental procedure is designed to remove water from the mines.

An extension of this experiment to other mining operations could require a considerable change in operating technique calling for the elimination of underground sumps and transport of underground water through pipe or lined flumes. Also needed will be more pumping capacity and operational control. Certainly these measures are not to be taken until experimental work has proven its value and there is every probability of its success.

The stream-polluting effects of acid mine-drainage could be mitigated somewhat by the use of demand storage reservoirs (above ground). Acid waters pumped during low river flow could be stored temporarily in the reservoir and released at periods of high flow to minimize the effect on aquatic life and also to permit maximum use of dilution as a disposal method. This system is practiced in certain areas where space and topography favor construction of large lakes and where state regulatory measures allow such progressive measures.

Refuse Dumps or Gob Piles—Much of the pyrite and marcasite associated with coal is removed from the mine as refuse or separated from the coal during cleaning and, along with rock and clays, is moved to a disposal area. These refuse materials may constitute as much as 30% of the material taken from a mine and have a sulphuric-acid-producing potential quite high in relation to the volume. The process which cleans the coal in effect enriches the potential. It is also heightened by this fact. The acid-producing area of a gob pile includes not only exterior surface acreage but also much larger amounts of interior acreage.

Acid from refuse piles may be leached out by water and carried into the streams in four principal ways: (1) flooding; (2) surface runoff; (3) natural drainage through the piles; and (4) use of the refuse pile as a filter for coal washery sludge. The first two methods are occasional in nature but provide ample opportunity for building up large acid concentrations on exposed refuse surfaces. When transported to streams, this acid reaches its highest concentration rapidly and causes great harm to aquatic life cycles. The third and fourth leaching methods provide a more continuous, though not necessarily uniform, flow of acid from the gob pile.

Control of acid water from gob piles does not present the extremely complex problems associated with underground acid drainage. As this is a man-made problem, it can be successfully mitigated by proper disposal practices. For proper disposal, refuse should be:

1. Sized to eliminate large particles (2 in minus makes an excellent size but some larger materials can be tolerated if evenly distributed).

2. Dumped in a pile site carefully selected to eliminate underground water flow through the refuse pile.

3. Compacted thoroughly to minimize airflow in the pile.

4. Covered with an adequate vegetated-soil cover, constructed to divert surface water from the pile and to minimize or eliminate cover erosion.

The above steps are equally applicable to refuse disposal for both air and stream pollution abatement.

In one novel approach to refuse disposal, refuse is crushed to a fine size and pumped to a large sludge pond along with other washery sludge. This pond is large and deep enough to provide for a reasonably long life even when receiving such a large volume of material. The pond also permits good clarification of the effluent liquor. Refuse so disposed does not continue to oxidize as it is inundated and effluent water is free from both acid and suspended solids.

The rather radical approach of underground stowage of refuse should not be altogether neglected as a possibility. Even though mining regulations, economics, and the mechanics of underground stowage are large stumbling blocks, they are being overcome in other countries and, at some future time, may become more attractive here.

Strip Mines—The greatest strides toward stream-pollution abatement have been made in the strip mining of coal. Several states have legislation dealing with this phase of pollution. However, Ohio and Pennsylvania are probably the most notable for their achievements.

The principles of "clean stream" stripping were developed before legislation was enacted. In general, these principles are:

1. Eliminate water wherever possible in the strip cut through surface water diversion and stream relocation.

2. Segregate and cover (in the strip pit) coal measures not recoverable as coal.

3. Reseal the exposed face of the coal through proper backfilling and water impoundment, or both.

These measures have proven adequate and are enumerated in the mining regulations of both Pennsylvania and Ohio.

Needed Most: Industry Coordinating Committee

The action program cited earlier proposed certain concrete steps that coal might take to move away from a defeatist attitude in solving the problem of acid mine drainage. The breadth of activities recommended suggests the need for setting up a producers' coordinating committee to:

1. Provide leadership in planning an industry-wide program.

2. Organize a nucleus staff of consultants—chemical engineers, pollution-control authorities, research scientists and public relations men—to implement the program.

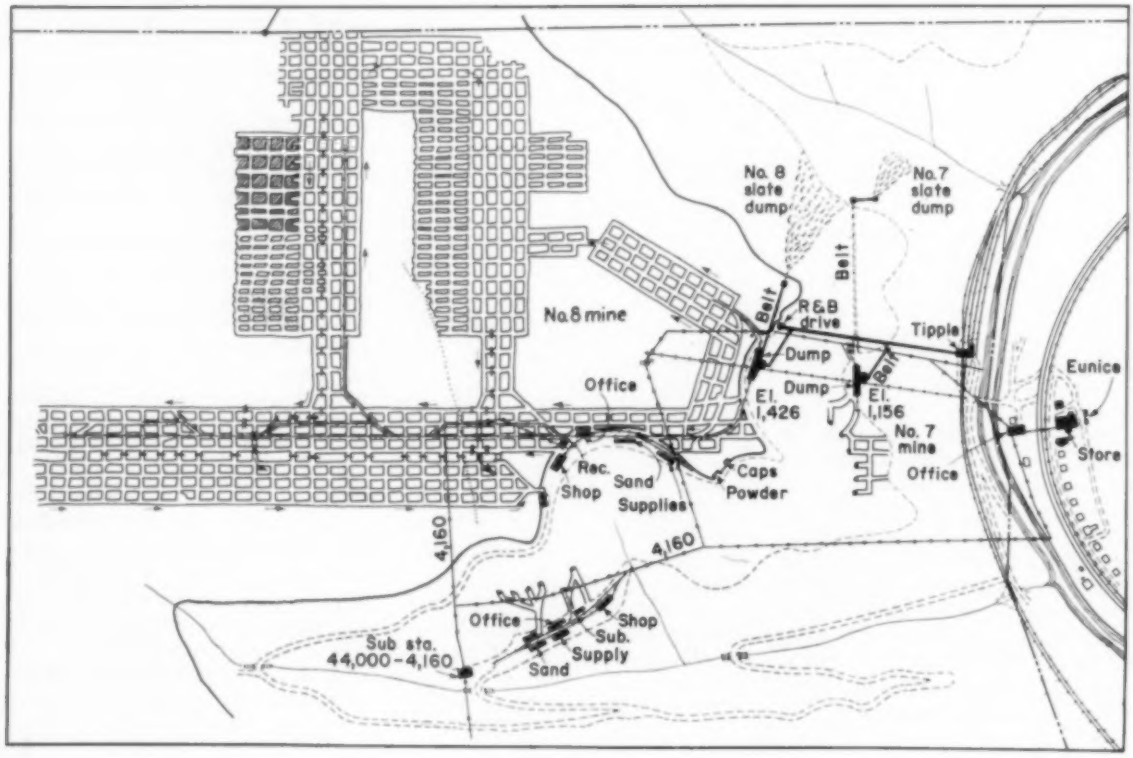
3. Obtain the financial support needed to sustain a continuing, long-range effort. (Although individual companies spend undetermined amounts as part of operating expense, present industry-sponsored research runs about $40,000 annually—a meagre amount in terms of the importance and complexities of the acid mine-drainage problem.)

The proposal to establish a producers' committee is in no way intended to discount the outstanding jobs that have been done by ORSANCO's Coal Industry Advisory Committee under the leadership of Henry Hebley, and by Dr. S. A. Braley, Mellon Institute who, virtually single-handed, has carried the industry's ball in research for many years.

Rather the proposal is intended to recognize the need for expanding upon such fine efforts. It also recognizes the need for added machinery to protect the industry from the very real possibility of punitive or unrealistic legislation. Most of all it recognizes this fact: IT'S LATER THAN YOU THINK.

WITH A COMMON TIPPLE, the new Nos. 7 and 8 mines in the West Virginia Div. of Truax-Traer are served by separate headhouses. No. 7 is the lower. Structures at top of mountain were left over from earlier mining by another company.

How Truax-Traer Built for Efficiency



NEW HIGH-CAPACITY LOW-VEIN LOADERS are employed at Nos. 7 and 8 mines, and are supplemented by a semi-experimental continuous unit in No. 8.

At Nos. 7 and 8 Mines

Layout and equipment coordinated for maximum productivity and minimum investment in coal 36 to 48 in thick. New high-capacity loading machines served by shuttle cars and rope belts carry the production load.

DESIGNED TO MAKE FULL USE of the higher capacity of new-type low-vein loading units, the new Nos. 7 and 8 mines of the Truax-Traer Coal Co., at Eunice, in the company's West Virginia Div., also were laid out for minimum investment in plant and equipment, as well as for minimum manpower for service operations, such as, coal dumping, supply handling and so on.

EIGHT-HEADING MAINS and five-heading panel entries characterize development at Nos. 7 and 8 mines. In regular operation, rooms will be mined in groups of five alternating with heading driving on one side and in retreat on the other. Blocks at the top protect bleeder openings. Map also shows portal facilities and relationship for the two mines; also location of tipple and other facilities and semi-experimental continuous-mining sections.

Capital investment has been kept down by rebuilding and modernizing such items as cutting machines and mine locomotives, while service labor has been held to a minimum by such steps as self-service lamp rooms, semiautomatic car-dumping facilities, automatic trip-loading stations underground, low maintenance track and well-protected haulageways. The aim is highest-possible tons per man in coal from 36 to 48 in thick—some containing up to 25% parting rock.

The new Nos. 7 and 8 mines were designed to replace the tonnage of other properties reaching the end of their useful life. Life of the new mines will be in excess of 20 yr and they were designed and equipped accordingly—but with provision for adding new types of equipment as it becomes available. One boring-type miner being used on a semiexperimental basis is expected to pave the way for additional continuous equipment in the future.

General responsibility for the design and operation of Nos. 7 and 8 mines, as well as for the operation of other properties in the West Virginia Div., is in the hands of a staff headquartered at Kayford, W. Va. It includes M. A. Sharp, general manager; Mack H. Shumate, assistant general manager; Harry M. Tibbs, administrative assistant; J. Q. Berta, general superintendent; W. R. Cuthbert, chief engineer; Rowland E. Powell, mining engineer; Bill Lewis, general master mechanic; and R. E. Hivley, general chief electrician. Ray Holbrook is superintendent of Nos. 7 and 8 mines. Lionel Morgan is foreman at No. 7 and E. E. Varney at No. 8.

Coal Thickness 36 to 48 In

The seams being recovered at Nos. 7 and 8 outcrop in the mountain above Clear Fork. Two other seams still higher in the mountain were mined out by the Princess Dorothy Coal Co. The rope-and-button conveyor and Princess Dorothy tipple were taken over by Truax-Traer and rebuilt to handle the product of the two new properties.

Mine No. 7, in the lower of the two seams being worked, started producing April 18, 1956. It was followed by No. 8 in the upper seam, 280 ft above, on June 15, 1956.

The seam mined by No. 7 is the Eagle. Thickness is 40 to 47 in, including two partings—one near the top and the other near the bottom. Usually one is thick and the other thin or missing. Parting thickness ranges up to 4 in, with even thicker bulges in places. The presence of these partings contributes to an over-

Tear Out to File

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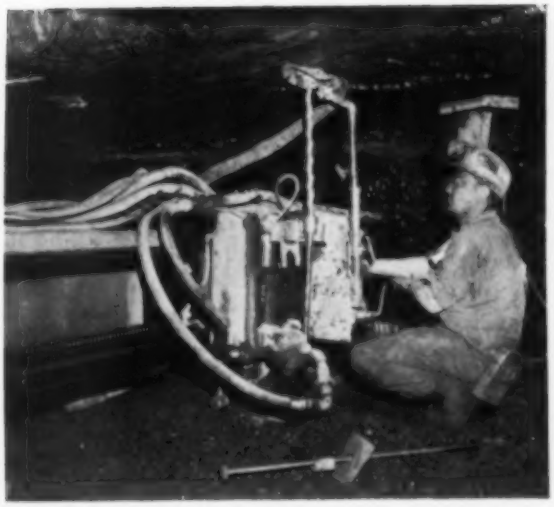
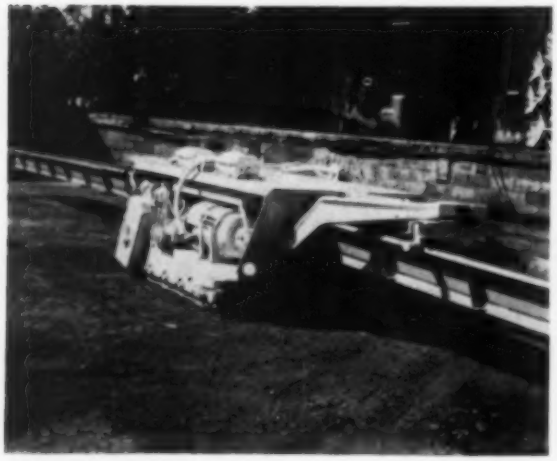


ROOF-BOLTERS, operated by one man, are equipped with vacuum dust collectors. Bolts are ⅝-in expansion-shell units.

RUBBER-TIRED MACHINES undercut the coal. Modernization included provisions to minimize cable trouble.

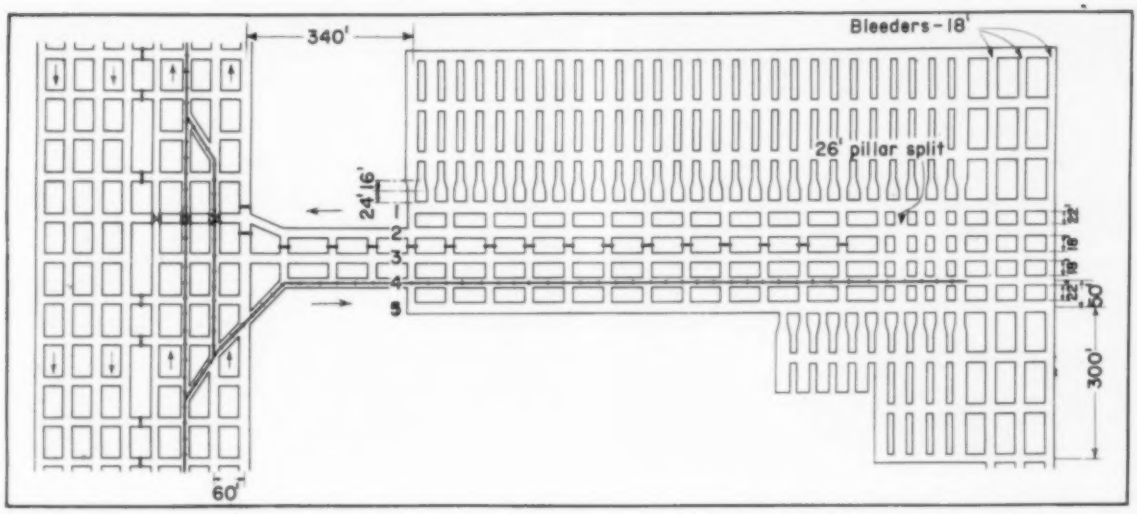
HYDRAULIC, handheld machines powered off the cutters drill holes for permissible shooting with extruded dummies.

COWBELLS FOR WARNING and fire extinguishers always in the same location are shuttle car features.



STRADDLE-TYPE carrier or transporter handles pans in groups of five in the continuous-miner section in No. 8 mine.

ROPE BELTS move coal from working places to transfer points for loading. E. E. Varney, foreman, checks unit in No. 8.



STANDARD PANEL PLAN employed at Nos. 7 and 8 mines is based on advance against fresh air at all times, and provides for bleeders. Two additional openings after passing the barrier provide adequate working places during heading advancement.

all refuse content in the raw product of around 25%.

The Eagle top is laminated slate and shale, tending to slack and slough after exposure. Kettle bottoms are fairly frequent.

Thickness of the Powellton seam worked by No. 8 mine is 36 to 42 in. It is free from partings. Although some bad areas are encountered, the top generally is good, consisting of laminated slate and shale, with some sandstone streaks. The Powellton, as previously noted, is 280 ft above the Eagle. Both dip generally 1½% away from the portals.

Mining Synchronized

The workings in the two mines are columnized, with development in the upper, or No. 8, mine always ahead of that in the lower, or No. 7. The mains consist of eight headings, each 16 to 18 ft wide on 60-ft centers. Crosscuts are made on 80-ft centers, except between Nos. 5 and 6 where the distance is 160 ft, to cut down the number of permanent stoppings. These, incidentally, are of concrete blocks.

The mains normally are advanced 2,000 ft between belt moveups. One loading unit is assigned to advancement of the mains. The belt, in No. 4 heading, feeds to a cross chain which carries the coal across to the trip-loading station located in No. 2 heading.

Room panels are opened with three headings 18 ft wide through the barrier pillar. After the pillar is pierced, the number is increased to five by adding a heading on each side. This is done to increase the number of places to the standard total. Centers are 50 ft and width for Nos. 3 and 4 is 18 ft, which is about the minimum with the shuttle cars employed. Nos. 1, 2 and 5 headings are driven 22 ft wide after the barrier is passed.

One unit advances the heading far enough to turn five rooms, which it then proceeds to mine out before returning to heading work for another five-room advance. Room width is 26 ft. Centers are 40 ft. Depth is 300 ft. Pillars are not mined, but recovery within panels is approximately 75%.

Normally, rooms on the return side are driven on the advance when the unit reaches to top of the panel, the centers of the last three rooms are increased and the length of the chain pillars is reduced to form blocks and bleeder openings. These are cut together as each new panel comes up to make a continuous opening back to the start of panel production. In addition to the standard bolting, the two bleeder openings are center-posted with locust for further protection against roof falls.

After completing the work on one side of the panel, the loading unit mines out the rooms on the opposite side in groups of five, and then moves ahead to repeat the process in a new panel.

Units Include Rope Belts

Loading units for the 36- to 42-in Powellton seam mined at No. 8 comprise the following.

1 Goodman 965 low-vein loading machine.

3 Goodman 870 shuttle cars with a capacity in the Powellton of about 2 tons.

1 Joy 12 RB cutter with 9-ft bar equipped with Bug Duster and using carbide bits.

1 Jeffrey A-9 hydraulic handheld coal drill—with the cutter.

1 Fletcher Hydro-Slide roof-bolter with M-S-A dust collector.

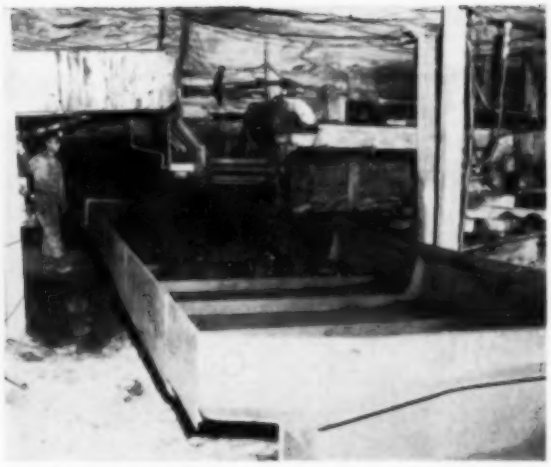
1 M-S-A Bantam high-pressure rock duster.

1 Goodman 97-HC 30-in rope belt capable of extension to 2,000 ft.

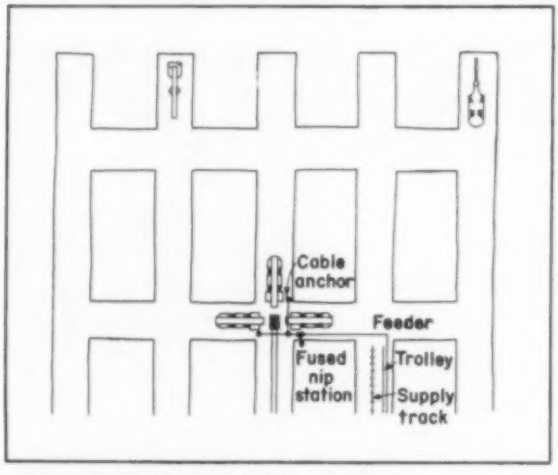
Units in the 40- to 48-in Eagle mined at No. 7 are the same except that Joy 6 SC shuttle cars are employed. These cars are approximately 10 yr old, but have been rebuilt and modernized to provide present-day performance with a minimum of maintenance. Since it was impossible to keep gongs in working order, let alone get them used, cowbells have been hung on the discharge ends of all shuttle cars. They ring constantly while the cars are in motion. Each car also has been equipped with a circular fire-extinguisher holder—all in the same place on each unit so that no time need be lost hunting for them.

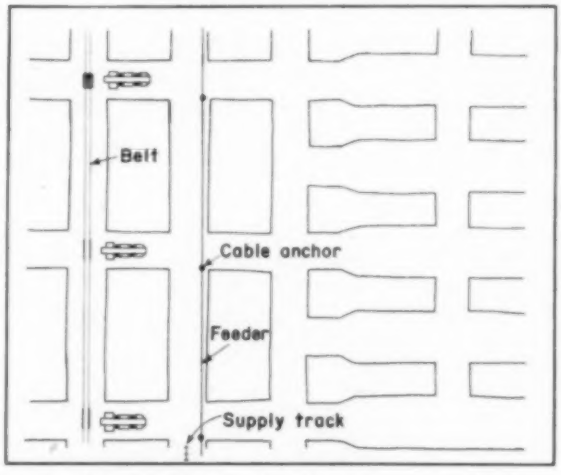
Each shuttle car is equipped with U. S. solid tires in front, while pneumatic tires have been retained at

BELT PROTECTION includes roller switch (left). At the right is an automatic switch for belthead water sprays.



DUAL TRANSFER STATION in No. 7 mine includes a yo-yo for switching the coal in changing the 8-ton cars.





END AND SIDE-DISCHARGE belt and shuttle-car setups at Nos. 7 and 8 mines. All cars have their own routes, thus keeping interference to a minimum. The plans provide for accommodating a maximum of three shuttle cars.

the discharge end. The solid tires thus are at the end that takes the beating from the rear conveyor of the loading machine, while the pneumatic units provide the operator with an easier, less-tiring ride. In addition, solid tires on all four wheels resulted in trouble with the wheel units. Cutting the number to two resulted in almost complete elimination of this difficulty.

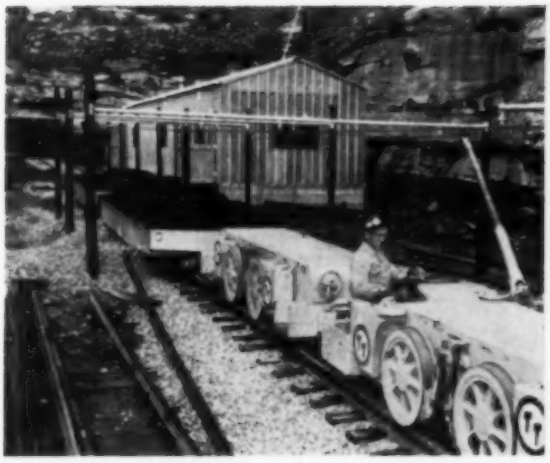
Calcium chloride is applied to keep down dust and provide a smooth surface on shuttle-car roadways.

All cutting machines have been equipped with bugdusters and with dual wheels in front not only for better traction but to enable the machine to stay put during cutting without adding weight. Rollers also have been added around and within the cable entrance and at the back corners of the machine to reduce cable damage. Before rollers, cable ruptures usually occurred at the entrance to the reel compartment, burning the stationary guides. Continued use inevitably resulted in cutting the jackets and quickly ruining the cable.

The Goodman 97-HC rope conveyors are equipped with Hamilton fire-resistant belts, USBM 28-3 designation. The neoprene covers are $\frac{3}{16}$ and $\frac{1}{32}$ in thick. Protection includes Ensign roller switches. Spray nozzles are installed at all transfer and discharge points, and are turned on and off by a solenoid-operated valve controlled by a belt-actuated switch (see accompanying illustration). When coal flows the weight depresses an arm mounting a roller in contact with the belt, closing the switch and operating the sprays. When coal flow stops, the belt rises to open the switch.

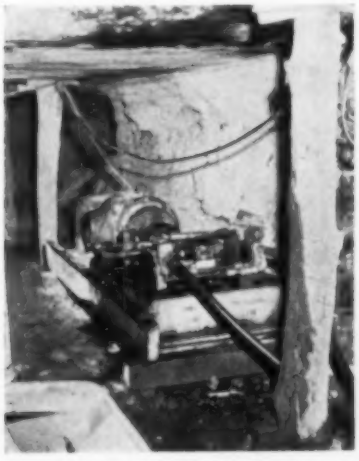
Water for the sprays, and for general use inside the mine, is supplied by a 10,000-gal tank on top of the mountain. A pump on Clear Creek supplies the tank. One result of this system is good pressure at all times.

Producing units in No. 8 mine include a Jeffrey 76-AM Colmol presently mining rooms 27 ft wide (three passes). Coal from the unit is handled by a 12 BU pickup loader discharging to a Long Piggyback feeding to a Long room conveyor. The room conveyor is moved in five-pan sections by a Long "straddle carrier" (see accompanying illustration).



TANDEM LOCOMOTIVES made from rebuilt and modernized gathering units handle main haulage at Nos. 7 and 8.

BALLAST SPREADING is speeded by these special cars, utilizing a dropbottom body and a shuttle-car motor and chain.



HYDRAULIC TRIP FEEDER takes the work and delay out of car-handling.

SEMIAUTOMATIC DUMP discharges coal and rock into separate bins.

Cycle Employs 11 Men

Makeup of a unit crew at both mines is as follows:

Loading-machine operator and helper.
Three shuttle-car operators.
Cutter and helper.
Roof-bolter.
Beltman.
Boomman.
Supervisor.

As the loader finishes up in a place, one of the three shuttle cars goes to the depot at the inby end of the supply track and loads up with the necessary supplies—posts, cap boards, bolts and tamping dummies which are delivered as soon as the machine leaves.

Bolting is the next step, using ⅝-in Pattin or Birmingham bolts. Eight bolts are placed in track and belt headings, and six in other headings. The bolter then advances the post lines along each rib by adding new props on 4-ft centers. Six bolts also are placed in the 26- to 28-ft rooms, and are supplemented by two rows of posts on one side and one on the other. No openings are left without posts.

After bolting, the place is ready for cutting on the bottom. In some sections in No. 7 mine where the bottom parting is troublesome the places are double cut. After cutting, the runner and helper drill three holes in the top in headings and four in rooms. The machine then starts for the next place after the operator and helper load the holes with Monobel AA, stem with extruded dummies (Lincoln Clay Products Co.) and shoot. The place then is ready for loading.

Regular inspection, cleanup and adjustment are the primary duties of the beltman. After completion of his assigned stint, he (and one of the shuttle-car operators when available) take care of other duties, such as, rockdusting.

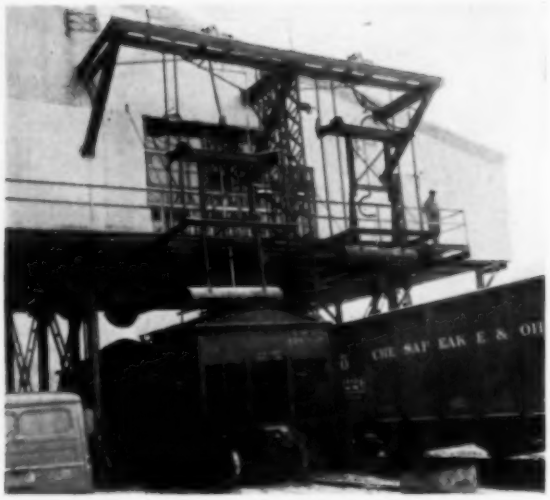
In heading advancement, particularly in the mains, where loading is at the tail end of the belt, the three shuttle cars have assigned discharge points—one over the end, one over one side and one over the other side, as shown in the accompanying diagram. The feeder line is jumpered over and cable nipping stations are established as indicated. Thus, each car has its own route and there is no interference or crossing of cable. In side loading, the usual situation in room work, the discharge points are normally set up as in the second diagram.

Routine inspection and maintenance of equipment are handled on the third shift by an electrician and mechanic.

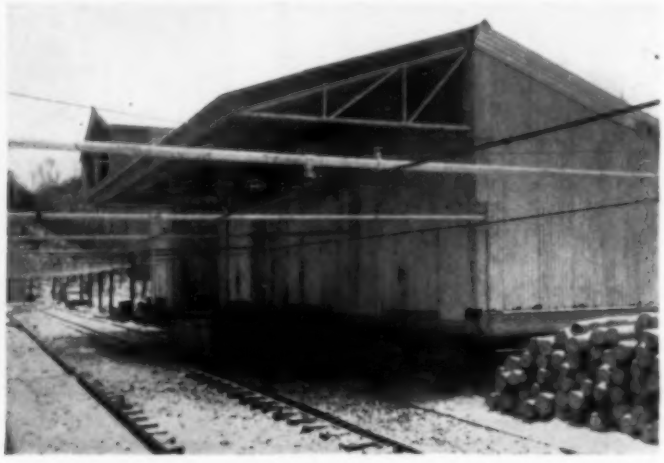
Final Haulage Stage Employs 8-Ton Cars

With ultimate hauls reaching more than 4 to 4½ mi, Truax-Traer management chose mine cars and locomotives for the final haul to the outside. The track on which this rolling stock operates is based on 70-lb rail laid on 5x7-in creosoted ties 6½ ft long ballasted with slag. Turnouts

PORTAL SHOPS include pit, overhead crane and necessary facilities for inspection and minor repairs.



FACILITIES FOR OILING CARS to prevent freezing to sides and bottoms include hoist-operated spray units in guides.



SUPPLY FACILITIES include a roof-bolt bay (left) equipped with crane hoist. Canopy on mine-track side provides protection during loading in inclement weather. Hoist and platform also are available for handling other heavy materials and parts.

are Nos. 4 and 5. Ballast is spread by special cars (see illustration) made up of dropbottom car bodies (without the doors) mounted on steel channels between which are shuttle-car type bottoms. The ballast is fed out through a door by a Joy 24-J motor which is engaged and disengaged by a 6 SC conveyor clutch. Ballast is tamped with pneumatic equipment.

Supply tracks are laid with 40-lb rail on steel ties. The supply track also accommodates the mantrips, made up of 24-in-high 16-man Irwin cars pulled by low-vein MH-150 locomotives.

The haulage locomotives have been made by hooking MH-88 locomotives in tandem, rebuilding them in the process to create units of approximately 13 tons. In rebuilding, the units are equipped with hydraulic brakes, dynamic braking facilities and hydraulic sanders. One such unit can handle 15-car trips. Standard practice, however, will be 30-car trips, with one tandem unit pulling and one pushing.

Steel mine cars, supplied by Differential, have a capacity of approximately 8 tons. Equipment includes Differential spring couplers which engage automatically upon contact. Car height is 24 in. Length is 25 ft and width is 8 ft.

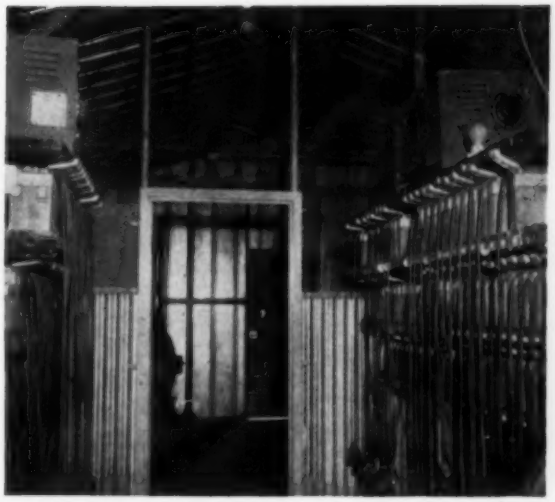
At present cars are loaded in trips of 15 at the belt stations with the assistance of hydraulic spotters. It is planned, however, to completely automate all loading stations with Stamler units, which were on order at the time this article was written.

Two Headhouses, One Tipple

Duplicate headhouses, both designed and built by Kanawha, serve Nos. 7 and 8 mines. Each comprises a Kanawha rotary dump, a 125-ton coal bin and a 75-ton rock bin, plus belt conveyors for moving coal to the rope-and-button conveyor and rock to the dump.

Dumping is semiautomatic. The locomotive pulls the trip in and stays coupled. The triprider presses the button to start the dump, which then completes the dumping operation automatically. The locomotive then pulls ahead, which permits the creeper to

NO. 7 MINE PORTAL, like No. 8 farther up, is placed on a bench cut in the side of the mountain.



NEW-TYPE SELF-SERVICE charging racks feature lamp-handling facilities at the portals serving the Nos. 7 and 8 mines.

engage the trip. The locomotive then cuts off to go to the empty hole, leaving the triprider to dump the remaining cars one by one. A motor-operated flygate can be used to divert rock to its separate bin, and the triprider also has a button to actuate the rock-disposal belt.

After the coal goes into the coal bin, it comes under the control of the tipple force. Bindicators and other control and indicating equipment permit the tipple force to run the plate feeder as desired to place the coal on the cross belt feeding the rope-and-button unit. Emergency buttons at strategic locations permit shutting operations down from various points when necessary.

Rock and coal belts from the headhouses are 36-in Goodyear units, Style B rayon, with 3/16- and 1/16-in covers. One rock belt goes underground to the dumping location across a point, and consequently is of the fire-resistant type.

Coal from the Powellton and Eagle seams is always kept separate in handling and preliminary rough cleaning. Final cleaning and sizing is done at the Truax-Traer central plant at Ceredo, W. Va.

Coal discharged into the two-track tipple by the rope-and-button conveyor first passes over a shaker with 4-in round perforations. The through product goes directly to the car. The lump goes to one or the other side of a shaking table following the screen, depending on its origin.

In the case of the Eagle coal, the

SAND-HANDLING units include truck ramp and hopper (right) next to drying house. The sand is shoveled through a hatch into the stove for drying and then falls to a concrete floor from which it is dispensed to locomotives or loaded into sand cars.

MANAGEMENT MEN—Mack H. Shumate (left), assistant general manager; Ray Holbrook, superintendent, Nos. 7 and 8; and Orville Basham, section foreman, No. 7.

screen acts somewhat like a rotary breaker, meaning that the overproduct is predominately rock. Consequently, the coal is picked out of the rock, which then goes to the rock bin without being touched. The Powellton coal, having much less rock content, is picked conventionally. After picking the lump joins the through product on whichever track is receiving it.

The tipple is arranged so that one man can see and control all operations, including loading. Coal from either seam can be loaded on either track, and motor-operated flop gates divert the stream during car-changing. Brownie retarders capable of handling two cars are employed.

A feature of the tipple is provisions for freezeproofing cars with Ashland car-spray oil. Four sprays on a manifold inside a semicircular hood are used to apply 6 or 7 qt of the oil to the insides and bottom of each car as it is dropped down to loading position. As the accompanying illustration shows, each spray rack is suspended on a hoist and runs in guides, so that it can be lowered into position and the sprays started by pushbutton controls.

Portals Stress Convenience

The portals for both mines are identical in facilities though slightly different in arrangement. Butler buildings are used throughout, and the facilities include the following:

1. Separate concrete cap and powder houses around the hill from the main portal buildings.

2. A 5-ft Jeffrey Aerodyne fan.

3. Shop with 5-ton overhead crane and pit for minor repairs. Major repairs are handled in the main shop at the mine office in the valley.

4. Sand-drying installation consisting of a concrete truck ramp and bin next to the drying room. The sand is shoveled through a hatch into the stove for drying.

5. A substation equipped with a 500-kw portable rectifier. With a unit of this capacity (4,000 amp) the problem of sectionalizing equipment came up, and as a result both the mines employ new Ohio Brass 3,000-amp sectionalizing switches. The substations receive 4,160-V power from a 44,000-V transformer station. Both trolley and stranded feeder take DC into the mine, where distribution is handled by Ensign junction and distribution boxes.

6. An office building with offices for the mine foremen, for section foremen, for small parts and supplies, and for meetings and conferences. This building also contains the lamp room, which includes the new M-S-A low-voltage self-service charging units for the Model R-4 lamps employed at the mines.

7. A supply house comprising four rooms for, in order, calcium chloride and dummies, rock dust, cement, and oil. Between the cement and oil section is a roof-bolt dock with 2-ton overhead crane for taking bolts off trucks, storing them on rails and placing them in supply cars on the supply track on the opposite side from the truck road. The hoist also may be used for heavy parts or other heavy materials. The roof is extended out on the track side to form a shelter and thus protect both men and items from normal precipitation in handling supplies.

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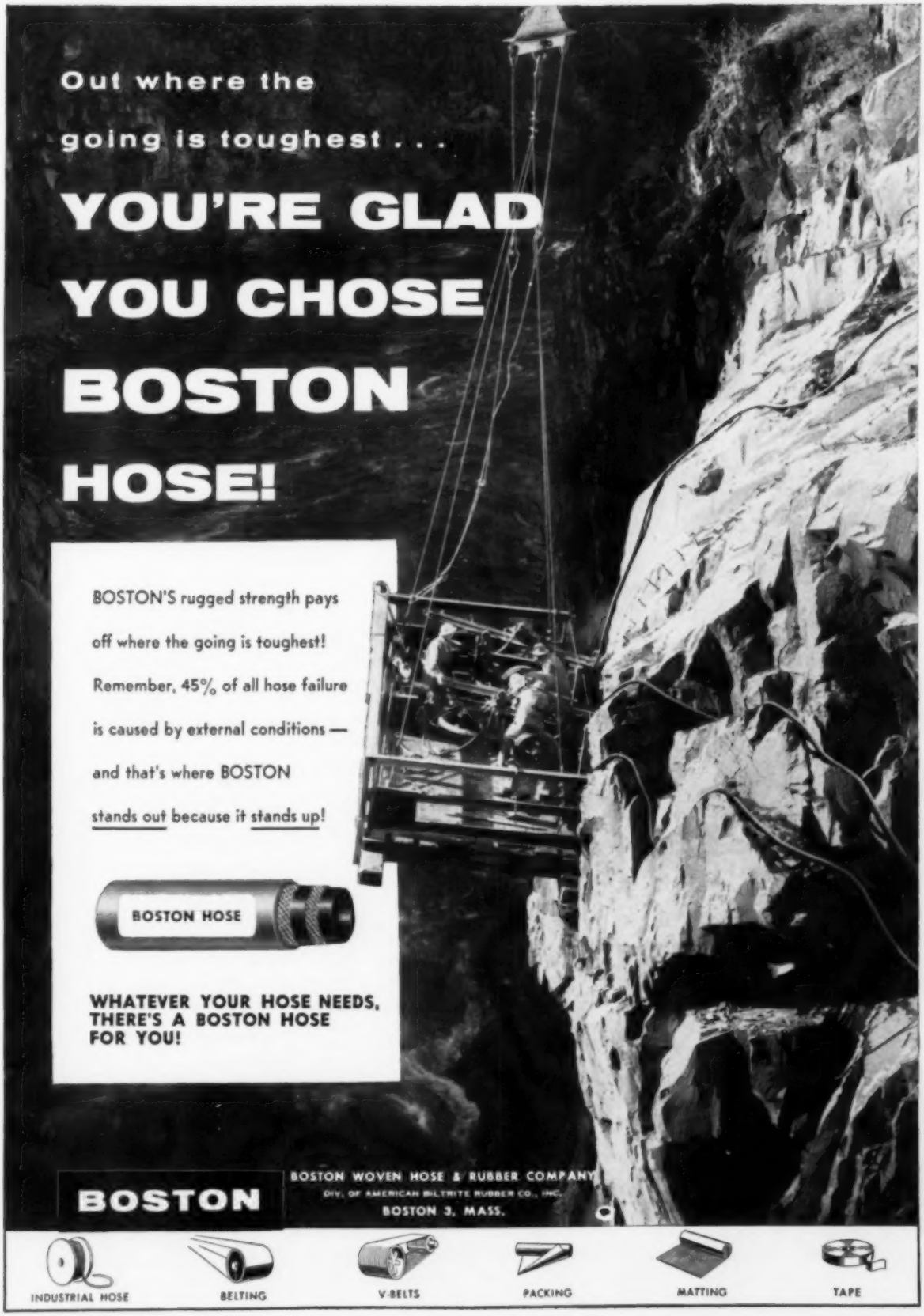
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Better Rope Clamp Cuts Downtime, Boosts Shovel Range

▲ **BEFORE** **SECURING ROPE** required about 12 ft of space (arrow). Lower clamp limited dumping height.

▼ **AFTER** **NEW CLAMP** (arrow) requiring only 4-ft space between anchor point and clamp.

Problem: How to dead-end big 2½-in hoist ropes on 60-yd shovel to eliminate slipping in clamps or damage to rope.

Solution: Design and fabrication of large tapered split-wedge clamp for large rope.

Results: Elimination of downtime caused by hoist ropes slipping or breaking at clamps and a 5-ft increase in shovel dumping height.

A 5-FT INCREASE in dumping height and elimination of downtime caused by the hoist ropes slipping or breaking at the clamps are boosting the output of Hanna Coal Co.'s Mountaineer shovel. These gains are the direct result of adapting a new-type rope clamp for the big 2½-in hoist ropes.

Even when the big 60-yd Mountaineer was still in the design stage, Hanna officials began talking about how to dead-end the large 2½-in hoist ropes. They knew that the new shovel would be bigger and faster, and would be handling heavier loads. Consequently, something other than the wedge and socket used on the Marion 5561s would be needed.

After the Mountaineer was built, rope clamps and thimbles were provided as anchors for the 2½-in hoist rope, but the company found from practical experience that this type of anchor was not satisfactory. Ropes were damaged either because they were pulled through the clamps, or if the clamps were made tight enough, the wires were affected and soon broke. As a result, the hoist ropes had to be replaced prematurely.

Although the company was concerned about the $3,000 that each new hoist rope cost, it was more concerned about the downtime. It took a minimum of 4 hr to secure a hoist rope if it slipped in the clamps and it required 8 hr to put on a new rope if it failed at the clamps.

Out of 29 hoist ropes installed on the Mountaineer from January, 1956, to September, 1957, seven either slipped or broke at the clamps. Since the new grips have been installed there have been no failures from the ropes slipping or breaking at the clamp. This no-failure period extends from September, 1957, to April, 1958.

Increasing Spoiling Height

The increase in dumping height is possible with the new clamp because it requires only 4 ft between the anchoring point on the boom and the end of the clamp. To properly attach the ropes, according to engineering formulas and using conventional clips, took 10 ft of space, but in actual practice about 12 ft was needed to try and prevent ropes from slipping with additional clamps. This meant that the dipper sheaves could be raised only until they touched the

27 TON pull test shows 4-way expansion of O-B Shell and Plug!

On the left, a plug from an O-B Bail-Type expansion unit. On the right, an identical plug after tensioning to 54,000 pounds — *6 times* the normal bolt load!

The test was made with a special bolt installed in a 1⅜ inch hole drilled in quartzite by an O-B customer operating a South African gold mine.

As shown in these unretouched pictures, the plug was compressed 22% and elongated over 30% by the tremendous pressures exerted against it. But, because those expansion pressures were distributed evenly four ways, reducing unit stresses to an absolute minimum, the O-B plug refused to break and release the bolt.

Four-way expansion is *another* reason why "they go up easy *and stay put!*"

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co. Ltd., Niagara Falls, Ont.

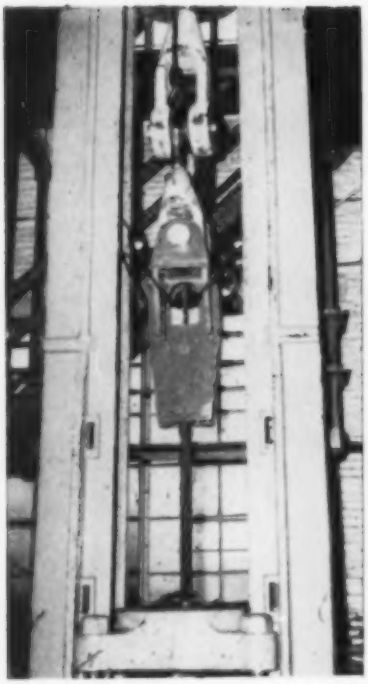
PLUG BEFORE TEST

PLUG AFTER TEST

Ohio Brass

O B
SHELLS AND PLUGS

4827-M



NEW GRIPS underwent rigid examination before being installed on shovel, including this pull test at rope manufacturer's laboratory.

CLOSE-UP VIEW shows compact design. Gripping is provided by tapered split wedge moving on backup plate and roller bearings.

lowest clamps anchoring the ropes.

This gain in dumping height was not considered in designing the new rope grip, but it was soon discovered in the field. As a result of increasing the dumping height, the dipper moved back toward the shovel approximately 3 ft. The dumping radius was reduced accordingly and the spoil banks became steeper. To overcome this, 3 ft were added to the handle when a new dipper was put on the machine. The net result of increasing the dumping height is that the machine can dig to higher banks and thus increase the life of stripping areas.

Developing the Clamp

Suggesting ways to improve equipment performance and design are two of the jobs assigned to Hanna's engineering department. In the past, wire-rope problems had been assigned to A. F. Meger, mechanical engineer, and he fell heir to the problem of finding a better way of anchoring the 2½-in hoist ropes on the 60-yd Mountaineer shovel.

While turning the problem over in his mind one day, Mr. Meger recalled using a different type of rope grip on ship rigging in the South Pacific while serving in the Navy on the attack transport APA31. The grip incorporated a design that permitted quick gripping and fast release without damaging the wire rope. Since the grip was used safely on ropes handling 30-ton tanks, Mr. Meger asked himself why a similar clamp could not be used on the shovel ropes.

The next step was to find out if a similar grip could be bought today. Mr. Meger got the answer one day while explaining the problem to Charles Evendon, wire-rope engineer for the Jones & Laughlin Steel Corp. Mr. Evendon recalled that a company in Philadelphia, now the Lucker Mfg. Co., made a grip similar to the one sought by Mr. Meger for Hanna Coal.

Hanna immediately contacted the Lucker company and discussed with Lawrence Lucker, owner and chief designer, the possibility of incorporating his design principle in a grip for the 2½-in rope. Although his company had never tried making grips this large, Mr. Lucker felt that it could be done. From then on it was a case of Hanna engineers cooperating with Lucker to develop the grip.

To make the grip as light as possible and get away from casting, the engineers decided to go into T-1 steel for fabrication of the body and jaws of the new grip. To instruct the Lucker workers in the proper T-1 welding procedures, Hanna sent its welding foreman, Robert Garbesi, to the Lucker plant.

One of the important reasons for going to T-1 steel, the company reports, is that you are more sure of what you are going to come out with. There is no chance of the troubles which are inherent in the casting process.

Two of the new grips were fabricated as test models to be installed on the giant stripping shovels. After the grips were made, they were heat treated, magnafluxed and then tested to the breaking strength of 2½-in rope at American Steel & Wire's testing laboratory in Trenton, N. J. The next step was to bring the new grips to the pit and put them on the Mountaineer. This was done in September, 1957, when they were installed with used ropes to test thoroughly before trying them on new ropes. The used ropes worked until October 30 before being removed. Both the rope and grips were dismantled and thoroughly checked at this time. Inspection proved that the grips were workable and they were then used on the next new ropes installed. With some few minor changes now in process, this new design will be standard for all future clamps.

How the Grip Works

The basic design principle of the Lucker grip is a tapered split wedge moving easily on hardened and ground backup plates and roller bearings. The harder the pull on the rope, the greater the gripping force of the wedges. The original unit had a 2-ft gripping length, but the final design calls for a 3-ft gripping-jaw length. This is added insurance to spread the pressure over a larger area. It also reduces the load on the individual rollers of the roller bearings for more bearings are incorporated in the longer unit. Finally, the squeezing effect will be spread over a larger section of rope, reducing interwire and interstrand nicking, which should insure higher rope strength in the gripping areas.

Use same L-W prime-mover in stripping and hauling

You save on original equipment investment . . . and reduce operating costs

Stripping overburden is different from mining out pay ore or rock. It is basically a *scraper* job—can be handled most economically by modern scrapers. They leave your shovels and haulers free to maintain steady production.

Yet, since stripping is not a continuous operation in most pits, you need a multi-purpose machine — one that can quickly switch over to hauling shovel-loaded material when you catch up on stripping of overburden.

You get this advantage with the LeTourneau-Westinghouse Tournapull® line. These L-W machines keep equipment investment and operating costs low *all year long* because of their interchangeability feature (see panel). The prime-mover—major part of your original machine investment—interchanges with a variety of profit-making work trailers for other specialized duties. They handle your stripping, land-leveling, roadbuilding, pit-hauling, and waste product disposal efficiently, and at low cost.

Cut costs on your operation

The next time you consider investing in new stripping or hauling machinery, investigate Tournapull. Ask about the multiple work bonus you get (at fractional cost) from its interchangeable L-W trail units. Ask for specifications and prices on all 3 sizes. All have road speeds of close to 30 mph, ability to turn 180° non-stop in less than their own length.

L-W Tournapull Scrapers in 3 Sizes

Size	Diesel HP	Maximum MPH	Bowl Capacity Yards	Bowl Capacity Tons
B	335*-330	30.0	27	32.5
C	210	29.9	18	20.0
D	138	29.5	9	10.0

*when torque converter is specified

P-1860-MQ-1

Interchangeable Rear-Dump

Tournapull scrapers interchange with other L-W trailing units behind the same prime-mover. For pit work, the Rear-Dump offers economical hauling ability, and simple operation — plus all the advantages of Tournapull speed and mobility. Bowl capacities are 35, 22, and 11 tons. Other L-W trailing units, suitable for pit and quarry work, include bottom-dump and side-dump haulers.

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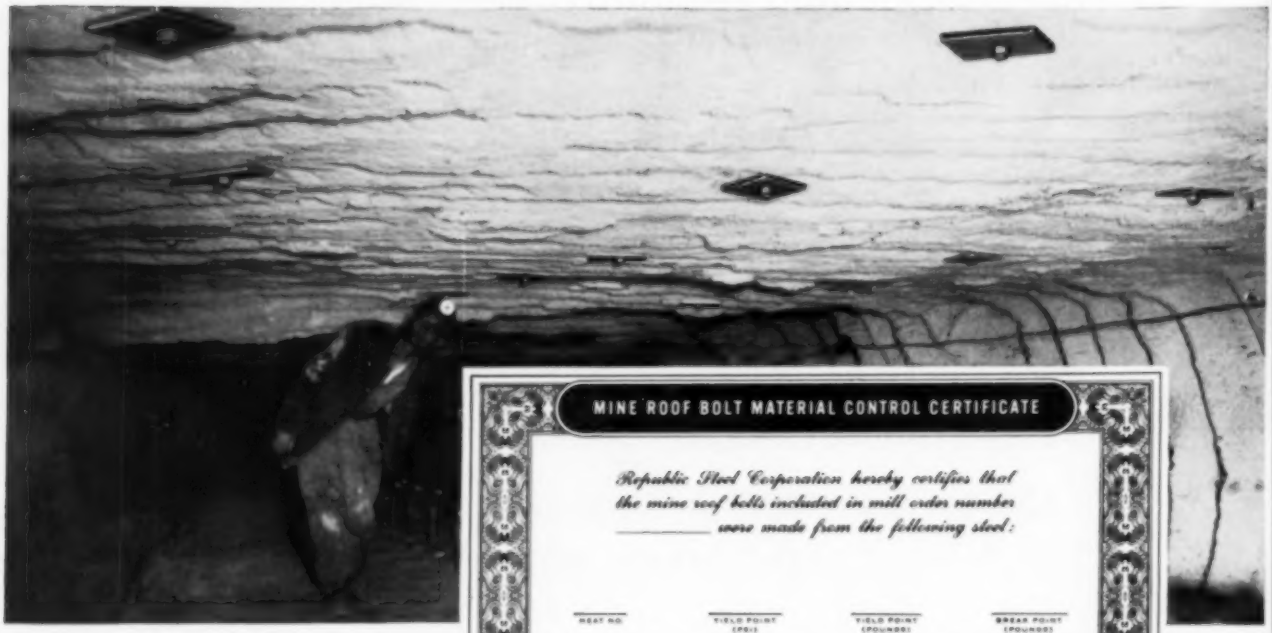
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Republic Steel Corporation hereby certifies that the mine roof bolts included in mill order number _____ were made from the following steel:
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YIELD POINT (PSI)
YIELD POINT (POUNDS)
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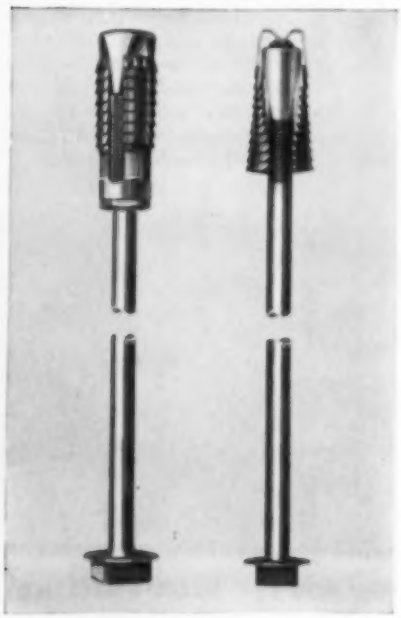
MATERIAL CONTROL CERTIFICATE FURNISHED BY REPUBLIC with every roof bolt shipment gives specific physical properties of the steel used in manufacture. Guesswork and assumptions about performance are eliminated. Illustration below shows Republic's newest and most versatile expansion shell designs. RE-2, at left, is designed for relatively soft formations and can be shipped assembled with the bolt or in separate components. RE-3, at right, is well suited to harder formations.



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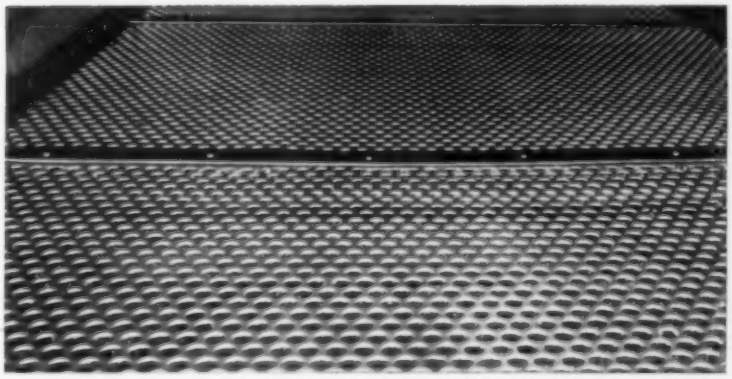
In addition to laboratory-certified steel, all Republic Roof Bolt Assemblies are backed by the findings of extensive field performance tests conducted in Republic's own mines. As a result of these studies, only Republic offers proved assemblies in all four major classifications. Moreover, this experience enables Republic impartially to recommend the type or types best suited to conditions in your mine, along with suggested methods of placement and spacing.

For complete information on certified-strength Republic Roof Bolts, contact your Republic representative or mail coupon.

MANY SUPERIOR FEATURES OF REPUBLIC'S NEW TRUSCON STEEL BUILDINGS contribute to their economical performance in mining applications. All parts are delivered in a complete package, including roofing, siding, windows, doors, and hardware, ready for fast, easy erection. Available in 32-, 36-, 40-, 44-, and 48-foot widths, 12- and 14-foot heights, and any required lengths, these Truscon "Budget Buildings" are ideal for personnel, equipment, or material shelter. Roofing and siding are galvanized to eliminate painting. Buildings can be dismantled and stored or re-erected to meet changing needs. Send coupon for details.

SUPERIOR STRENGTH PLUS CORROSION-RESISTANCE are two of the many features of Republic High Strength Steel which make it ideal for a wide variety of mine industry applications. In mine car and hopper car use, for example, these factors contribute to greatly reduced maintenance. Republic High Strength Steel also provides good impact and abrasion-resistance. It will pay you to evaluate all of these advantages in terms of your equipment performance specifications. For more information, mail coupon.

SUPERIOR PERFORMANCE OF REPUBLIC ENDURO® STAINLESS STEEL used for this cleaning plant shaker screen has drastically reduced replacement expense. Reason is ENDURO'S excellent resistance to abrasion and corrosion. Other characteristics of ENDURO which pay service dividends in mine equipment applications include its good strength-to-weight ratio, easy cleanability, and high impact strength. In addition, ENDURO is readily formed and welded, simplifying both manufacturing and maintenance operations. Mail coupon for data.



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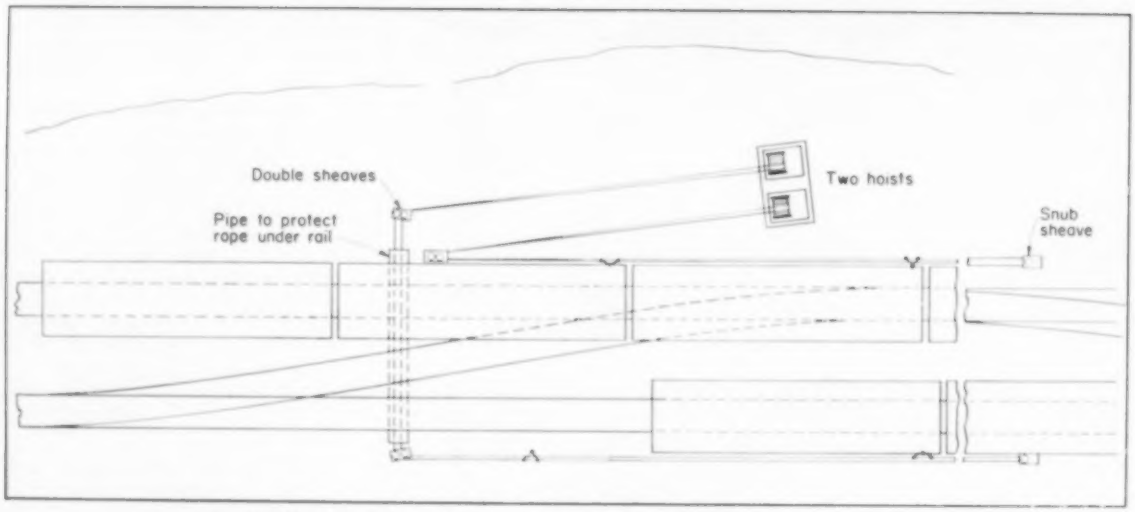


Fig. 1—INSTALLATION DIAGRAM shows location of hoists, sheaves and ropes.

Automatic Car-Loading at

TWO-WAY SLINGS are attached to each parallel rope. One set of slings and then the other can be attached to the cars.

CHUTE-GATE MECHANISM directs coal to the front or rear car. The rope and pulley is powered by a ¾-hp motor.

SENSING SWITCHES, mounted on the tipple, control the flow of coal, position of chute gates and movement of cars.

OPERATING BALL governs the amount of coal loaded in cars and also controls the movement of cars as they are loaded.

CONTROL STATION is operated automatically or manually.

DOUBLE-ROPE HOISTS make it possible to pull and retard.

South-East Coal

New double-rope hoist and automatic switches automatically load railroad cars without the attention of an operator.

GREATER EFFICIENCY and a more continuous loading cycle with a minimum number of men are top benefits resulting from an automatic railroad-car loading installation at South-East Coal Co.'s Millstone tipple, Seco, Ky. Hoist facilities permit handling four cars in tandem on each of two tracks without delays while supplying empties or removing loaded cars. Sensing switches operate controls for the movement of cars, for transferring loading chutes from one car to the other, and for loading each car uniformly without the attention of an operator.

The tipple serves the LaViers No. 2 mine which crushes, screens and loads the coal into railroad cars. These cars are then transferred to the company's Big Chief plant where the coal receives final preparation.

The company had three objectives in the installation of the new car-loading facilities:

1. Supplying empties and removing loads without delays during the change-over period.
2. Controlling the movement of cars during loading.
3. Controlling the flow of coal from the loading chutes.

Equipment necessary to satisfy these requirements consists of two Sanford-Day Model HKO hoists rated at 12,000-lb pull and geared for a speed of 20 fpm. They are designed to accommodate two ropes so that they can pull and retard at the same time. Reversible loading chutes direct the flow of coal and electrical equipment controls the various operations of the loading cycle.

The chute-gate mechanism is operated by a ¾-hp gearmotor connected to a gate lever by a rope-and-pulley arrangement. However, this has not proved too successful because the rope slips on the pulleys at times, especially when a lump of coal gets lodged between the gate and chute frame. The company is in the process of changing the rope-and-pulley arrangement to a hydraulic jack, whereby a more-positive operation will result.

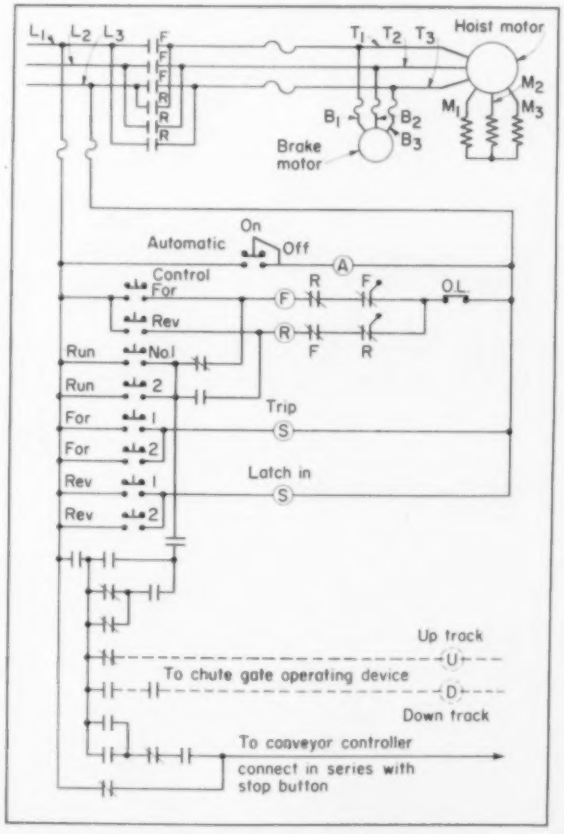


Fig. 2—WIRING DIAGRAM shows hookup of hoist and controls.

Now a proved DROP BOTTOM CAR SPOTTER that will give you Dependable Performance!

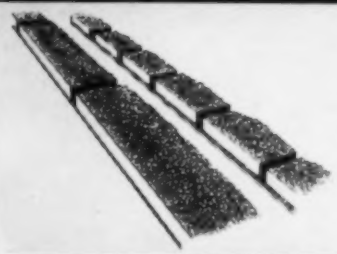
Here is the simple S-D "DBS" Hydraulic Car Spotter shown with Sanford-Day Power Unit.

SANFORD-DAY
KNOXVILLE TENNESSEE

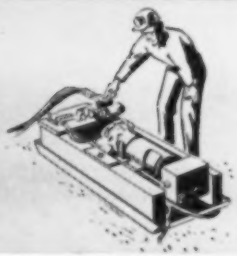
S-D "DBS" SPOTTER effectively moves trips without damaging doors because pushing dogs operate outside door compartments!

S-D "DBS" SPOTTER is the most portable spotter available. Track unit is in two sections, each 1200 lbs. and only 18 feet long.

S-D "DBS" SPOTTER offers you ONE STANDARD SPOTTER for cars from less than 10 feet in length to over 30 feet!



S-D "DBS" SPOTTER Power Unit is specially designed with hydraulic controls located on the power unit itself in one panel for convenient and easy servicing! No hydraulic control valves are located on track unit!



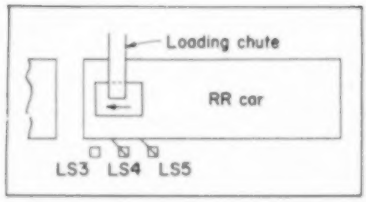
After several years of development and testing, Sanford-Day engineers have found the successful design in a drop bottom car SPOTTER that offers you dependable performance for far greater efficiency where fast-rate loading is desired at loading points. This new, but proved, spotter is the *S-D "DBS" Hydraulic Car Spotter.* It completes our line of S-D Spotters and S-D "Brownie" Hoists for every requirement, including S-D Hydraulic Car Spotters for Rotary Dump Cars and cars of all designs. You are going to like these S-D Spotters for their consistent effectiveness and dependability! Write us today noting your particular requirement and let us help you fit the correct SPOTTER or HOIST to your needs. Sanford-Day Iron Works, Inc., P. O. Box 1511, Knoxville, Tenn., USA.

S-D "Brownie" Hoist-and-Retriever Combination

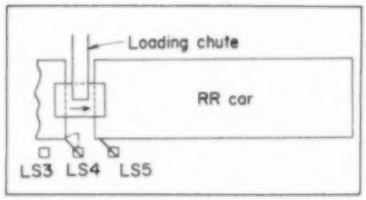
Where loading conditions do not require a hydraulic car spotter, the S-D "Brownie" HKD Hoist-and-Retriever Combination is the efficient method of moving cars by loading points.

Automatic Loading Station

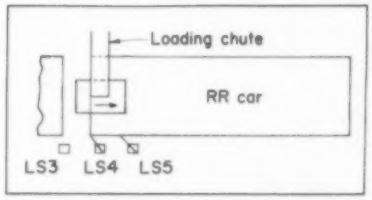
The sensing switches for automatic loading operate the following sequence:



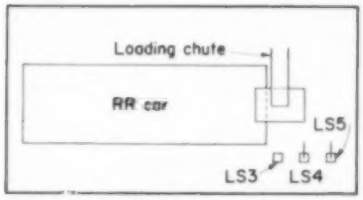
1 **The operating arms** of the limit switches, LS4 and LS5, and the timing switch, LS3 are mounted on the tipple to permit the arms to contact the car as it passes under the loading chutes. When both arms are in contact with the car, the hoist pulls the car forward as the loading ball (Step 5) operates overhead switches.



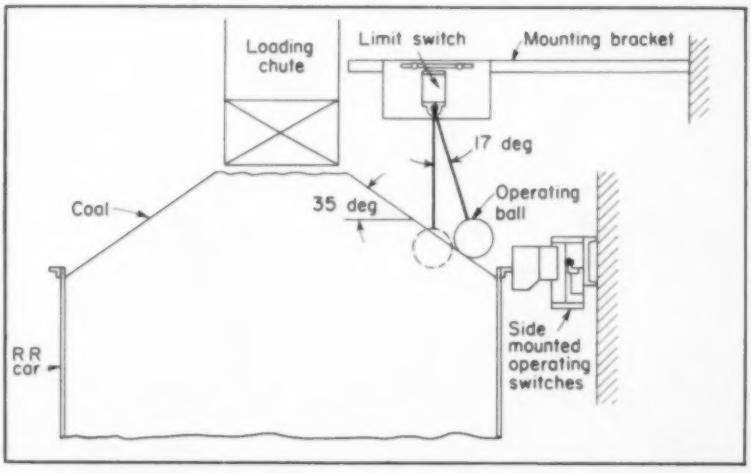
2 **In this step** LS5 is in contact with the rear car and LS4 is between the cars. Switch LS4 operates the chute-gate which reverses the flow of coal in the direction indicated. As LS4 drops between cars, LS3 takes over the control of the hoist and continues to move the car forward for a predetermined time interval.



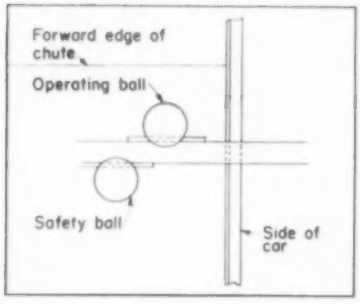
3 **Timing switch** LS3 operates long enough for LS4 to make contact with the next car and for the car to move ahead far enough to permit the chute-gate to transfer the flow of coal to the forward position. Note that LS3 takes over the control of the hoist as soon as LS4 drops between cars. Switch LS5 keeps coal flowing.



4 **Switches** LS4 and LS5 will drop out if for any reason additional cars are not supplied. This indicates that the last car has been loaded, stopping the operation. The chute gate reverses, the hoist stops and the conveyor stops. Switch LS5 controls this phase of the operation only when LS4 and LS5 are out at the same time.



5 **The operating ball** governs the amount of coal loaded in each car by operating the hoist each time the coal stacks high enough to force the ball outward 17 deg. The hoist does not move as long as the ball hangs straight. This operation continues the full length of the car, then switches LS3, LS4 and LS5 operate the hoist.



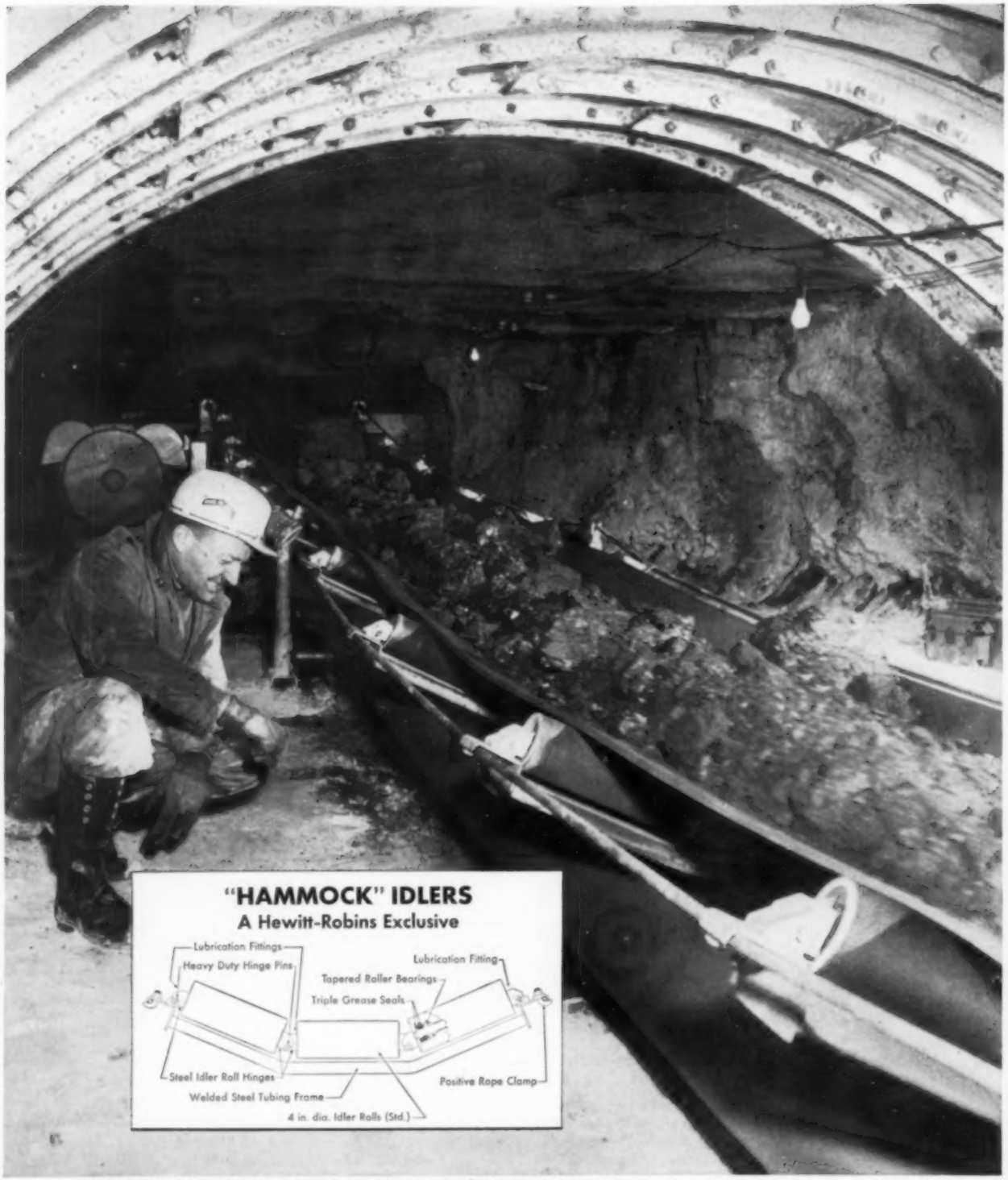
6 **The safety ball** operates only when coal has piled up in the car and the hoist has not moved the car forward. This ball is located in back of and more toward the center of the car than the operating ball. When the safety switch operates, it stops the flow of coal until the car is moved forward and the ball hangs vertically.

Electrical controls and sensing devices include magnetic control panels, limit switches, time switches and pushbuttons. The complete operation can be controlled automatically or manually. A simple pushbutton arrangement enables the operator to transfer the controls from one operation to the other, as shown in Fig. 2.

Hoisting Operation—As shown in Fig. 1, hoists are mounted side by side. One hoist is required for each track setup. Ropes from the hoist serving the outside track are encased in a 6-in pipe running under the tracks. The two ropes of each hoist run parallel to the track for the full length of hitching travel. One rope and then the other can be attached to the cars so there is no delay for rewinding the rope when changing connections.

Double slings equipped with heavy-duty hooks are clamped to each parallel rope. These slings are mounted so that the hooks face in opposite directions. This permits one hook to pull while the other is in a position to retard. They are spaced on the ropes so that as one set of slings reaches its maximum length of travel the other set is in position to be connected to the next string of cars.

Pant-leg loading chutes are equipped with gates to direct the flow of coal to the front or back cars. The gate position is controlled by a limit switch which is pushed over by the top edge of the car as it passes under the loading chute. The limit switch operates the chute-gate motor which in turn throws the gate in the desired position.



Self-contained, with its own anchor stands, the "Rope Stringer" conveyor can be used with any head or tail equipment.

"ROPE STRINGER"

The last word in low-cost, high-capacity, easy-to-handle conveyors

See how Hewitt-Robins has made the "Rope Stringer" conveyor easy to handle, economical to buy, simple to install and operate!

The "Rope Stringer" conveyor consists of simple support and anchor stands, the supporting wire ropes, Hewitt-Robins exclusive "Hammock" idlers, and Hewitt-Robins conveyor belt. The conveyor can be extended by a small crew and can be dismantled and set up in a new location in a fraction of the time required by rigid conveyors!

With this "Rope Stringer" conveyor, spillage is greatly reduced. Thanks to the catenary action of the "Hammock" idlers, spillage is less than one third that of a rigid deck conveyor. And safety is increased, too—the "Hammock" idler and frame assembly can be quickly removed or replaced as a unit, with the belt in place!

"Rope Stringer" Conveyor Advantages

Valuable features incorporated into this new Hewitt-Robins rope conveyor are made possible by the use of flexible supports and a unique "Hammock" idler arrangement. These give several major advantages:

Easy Installation

- Idlers are quickly skidded into position between belt strands.
- Trougher spacing is readily varied to suit conditions.
- Anchor stand assemblies can be bottom or roof mounted.

Better Operation

- Minimum spillage—load and belt are continuously centered by catenary action of hinged "Hammock" idlers.
- Longer belt life through cushioning action of "Hammock" idlers.
- Rounded idler frame protects return belt at points of severe dip.
- No training idlers required.
- Level travel assured because either leg of stand can be adjusted for height.

Provision for Relubrication

- Triple-sealed bearings can be easily relubricated.

Simple, Sturdy Construction

- Strong, welded tube spreader frame.
- Substantial, long-life link and hinge design idler rolls.
- 4, 5, or 6 in. idler rolls available.
- Removable link pin for idler roll replacement.

Maximum Safety

- Idler rolls and frame positioned as a unit.
- Double spreader prevents idler rolls from dropping onto return belt.

See for yourself how this new "Rope Stringer" conveyor can pay for itself promptly in *your* operations! Only Hewitt-Robins provides all the advantages of the "Rope Stringer" conveyor—*complete* with the H-R belt of your choice! For further details, consult your Hewitt-Robins representative.

HR HEWITT-ROBINS

THE NAME THAT MEANS EVERYTHING IN BULK MATERIALS HANDLING SYSTEMS...

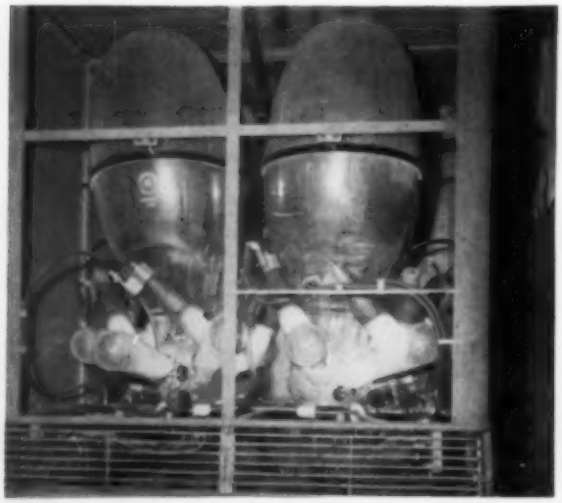
CONVEYOR BELTING AND IDLERS • POWER TRANSMISSION DRIVES • INDUSTRIAL HOSE • VIBRATING CONVEYORS, SCREENS & SHAKEOUTS

QUONSET BUILDING adds portability to permanent substation installations. It can be set up in two days by two unskilled men. Sufficient space is available to house the complete rectifier as well as the transformer, switchgear and borehole.

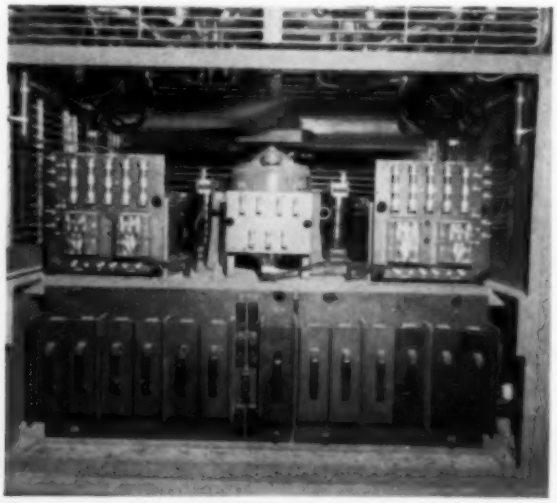
More Economical Power Conversion

A blend of ideas and equipment has produced a unique substation installation at Barnes & Tucker Co. Benefits are: Minimized substation costs, added portability of permanent installations, and simplified maintenance.

MINIMIZED COST, simplified maintenance and added portability to permanent substations are outstanding features of a new installation at the Barnes & Tucker Co.'s Lancashire No. 15 mine, Barnesboro, Pa. The newly adopted standard installa-



TOP SECTION of each rectifier cubicle consists of four glass bulbs. Mercury condenses near the top of the bulbs.



BOTTOM SECTION of rectifier cubicle contains fan motor and all control, operating and protective devices.

ARRANGEMENT OF EQUIPMENT in substation is (left to right) AC switchgear cabinet, transformer and rectifier. Borehole and DC panelboard are behind the rectifier.

tion houses a Hewittic (glass-bulb) rectifier, transformer, switchgear and borehole in an insulated Quonset building. Advantages of the rectifier are its low initial and installation cost with a high operating efficiency and reliability. And, because of the extreme simplicity of design and durability of the units, maintenance costs are exceptionally low. The Quonset building used to house the equipment can be assembled by two men in two days and can be relocated easily. The portability feature of the Quonset unit helps keep the number of buildings on the property to a minimum. It also reduces building maintenance and decreases taxes.

Power is purchased from the Pennsylvania Electric Power Co. at 12,000 V and metered at a central metering station. Approximately 15 mi of overhead transmission lines are required to distribute power to all surface substations operated by Barnes & Tucker. These lines are constructed and maintained by a crew of 10 men. When not working on power lines the men install substations and do regular shop work. Distribution of power by overhead pole lines enables the company to feed power from either of two directions. The power company also is equipped to supply power from either of two directions, making doubly sure that power failures are kept to a minimum.

All substations at the Lancashire mine are surface installations. Seven stations are in operation: two 300-kw and one 200-kw General Electric synchronous converters; one 300-kw Westinghouse rectifier; two 300-kw General Electric rectifiers; and one 500-kw Hewittic rectifier. All synchronous converters are equipped with automatic switchboards.

System protection is achieved by installing lightning arresters, grounding steel buildings, and providing dropout fuses at all substations and other important locations. Each substation can be isolated from the main power supply by pulling disconnects on the power pole or by releasing the main switch of the AC panelboard. They also can be isolated from the DC supply by disconnect switches located at the top and bottom of the borehole. Added protection to men working on stations is provided by having switches at both places. It would be impossible for someone to close both switches without the repairman knowing it.

Substation Design

Electrical equipment for a substation is housed in a Quonset Model 24 building manufactured by the Stran-steel Corp. Ecorse, Detroit, Mich. Quonset size is 24x25 ft. The height can be varied to provide adequate overhead clearance for equipment. This is accomplished by laying concrete blocks around the foundation and constructing the Quonset unit on top of the blocks. The building can be erected in two days by two unskilled men with hammers and screwdrivers. Ease of construcing and taking down these Quonset units makes them especially suitable for substations, since substations are frequently relocated to keep up with advancing mine operations. The buildings are insulated with Fiberglas insulating pads made by the Owens Corning Co. These pads help maintain rectifier operating temperatures between 45 and 110 F.

The company is trying a new type of building manufactured by the same company that makes the Quonset units. The new Stran-Master is several hundred dollars cheaper with all the advantages of the Quonset type.

Rectifier

The 500-kw Hewittic rectifier is manufactured in England by the Hackbridge & Hewittic Electric Co., which maintains an office in Pittsburgh, Pa. The rectifier consists of two steel cubicles which operate in parallel and as separate units. This setup permits maintenance work to be carried out on either of the units while the other continues to supply power to the system. Four large glass bulbs are used in each cubicle. The bulb design includes a simple method of establishing an electric arc between the mercury pool (cathode) and a graphite block (anode).

The arc is initiated by inserting a rod carrying a small amount of current into the mercury pool and quickly pulling it out. This operation is performed by electric solenoids mounted above and below the rod. It causes a small arc, and the tube fires within two or three cycles. Establishing an arc this way eliminates the need for a complicated firing circuit and helps simplify the rectifier.

Further simplification is achieved by the elimination of vacuum pumps, pressure gages and other accessories necessary for a water cooling system.

Roebling Presents

THE NEWEST CONCEPT IN WIRE ROPE

*Herringbone**

two ropes in one!

Here is a combination that has proved itself during three years of field testing. A welcome addition to Roebling's great line of wire ropes, Royal Blue *Herringbone* is both a regular lay and lang lay wire rope!

So, in one rope you have the greater flexibility and abrasion resistance of lang lay construction *plus* regular lay's superior stability under severe operating conditions.

Preformed Herringbone is made of two *pairs* of lang lay strands, and two strands of regular lay which separate the two pairs of lang lay—all of it made of Type 1105 rope wire.

For three years Herringbone has been used for general hoisting, holding and closing lines, shovel ropes, wagon scraper ropes and dragline ropes. Without reservation, its performance has been superior to that of any other rope used for the same jobs . . . even in the hands of inexperienced personnel! *Its proven capabilities clearly suggest its use for all jobs where steel core ropes are normally used.*

See your Roebling salesman for all the facts or write Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey. Roebling Herringbone, the two-in-one rope to meet the *doubly* stringent demands of today's economy.

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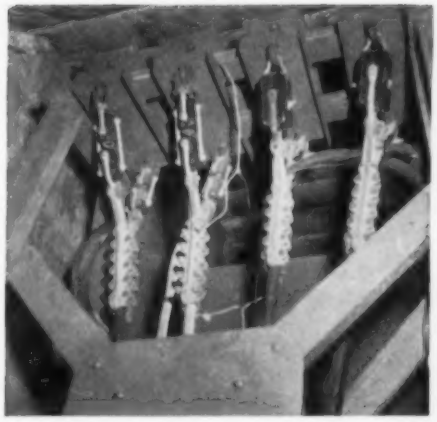
HERRINGBONE

WIRE ROPE

HIGH VOLTAGE LINES enter the building through special insulators.

DC PANELBOARD features a 3,000-amp automatic breaker.



BOREHOLE CABLES are suspended on a double A-frame structure and equipped with Y-clamps.

VARIATION OF THE BUILDING used in substation installations is shown above. It is several hundred dollars cheaper and contains all the features of the Quonset unit.

In fact, the only moving part in the rectifier is a 2-hp fan which circulates air around the large tubes to cool them and to help condense the mercury. The size of the tubes permits cooling by fan alone.

Other electrical equipment consists of a transformer that reduces voltage from 12,000 to 263. It is housed inside the building next to the rectifier cubicles. The base of the transformer is made as a two-way skid to aid in moving it in any direction with ease. In addition to the skid, jack posts are mounted on each corner of the transformer so that jacks can be used to position it. In contrast with an outside location, it is not necessary to build fences around transformers located inside the building. Protection from the weather helps reduce maintenance.

AC switchgear consists of overcurrent, phase-balance, phase-sequence and undervoltage relays, and an AC ammeter and voltmeter manufactured by the General Electric Co. A high and low thermo-relay was added to make sure that the rectifier would operate at safe temperatures. The 12,000-V main switch is by Allis-Chalmers. Design and construction of the control panelboard was by Joseph P. Manypenny Co., Philadelphia, Pa. The DC control panelboard consists of an ITE automatic circuit breaker rated at 3,000 amp continuous at 275 V, and a DC ammeter and voltmeter. Average load on the rectifier is 1,200 to 1,400 amp.

Borehole

With the borehole located inside the building and directly behind the DC panelboard, feeder lengths are shorter and they do not have to be run through the building to the outside. There are only three cables entering the building—all high voltage. Where the Quonset building is employed the borehole is 565 ft deep and is cased with 6-in pipe the full depth. The borehole was drilled before the building was constructed and a double A-frame was used to suspend the cables. The frame was fabricated at the maintenance shop from material on hand at the mine. The frame was made so that a bull wheel, shaft and bearings could be attached to it to permit lowering the cable into the borehole. A Dodge four-wheel Power Wagon is used for this purpose. The company has used the Power Wagon successfully since 1947. Brass bullet-shaped ends are soldered to the ends of the cable prior to lowering them into the borehole to keep them from getting fouled in the pipe. The bull-wheel is removed after the cable has been lowered and properly suspended on strain insulators. The wheel also is used on other installations for placement of borehole cables.

"As a result of combining new ideas and equipment, the company has effectively minimized substation costs, added portability to permanent installations, and simplified maintenance," says George Atkins, electrical engineer. "These features aid in providing us with a more economical means of converting AC power to DC."

REPORT FROM CATERPILLAR ON BIG HORN MINE:

Eleven big, yellow machines help

Balanced design and dependable four-cycle Cat Engine of No. 12 Motor Grader mean round-the-clock production, minimum down time. Operators like fast, positive controls, easy blading positions, unobstructed visibility.

mine 370,000 tons of coal a year

Hauling big loads fast is characteristic of DW21-No. 470 combinations. Turbocharged engine means efficient horsepower; LOWBOWL design provides less loading resistance and faster loading cycle. Capacity: 18 cu. yd. struck, 25 cu. yd. heaped.

At Big Horn Coal Company's mine near Sheridan, Wyo., 370,000 tons of coal are being stripped a year by a team of Caterpillar earthmoving equipment: five wheel-type CAT DW21 Tractors with No. 470 LOWBOWL Scrapers, two No. 12 Motor Graders, one D9 and three D8 track-type Tractors.

Opening a new pit recently, this team worked in sub-zero weather, fighting the poor footing of a river bottom. A 20-foot layer of sand and river gravel was removed —some 500,000 cubic yards. "We found the big tires on the scrapers and the greater flotation of the D9," says Mine Superintendent Cliff Artis, "helped us strip under adverse conditions."

Peter Kiewit Sons' Company, a construction firm of which Big Horn Coal Company is a subsidiary, operates the Caterpillar equipment on road and other construction jobs during the summer. This is real *versatility*, a hallmark of every Caterpillar product. It means more real value for every equipment dollar because Caterpillar machines do many jobs well.

For profitable production, you can't beat the combination of good machines and good dealer service. You get *both* from Caterpillar. Ask your Caterpillar Dealer today for an on-*your*-job demonstration.

Caterpillar Tractor Co., Peoria, Ill., U.S.A.

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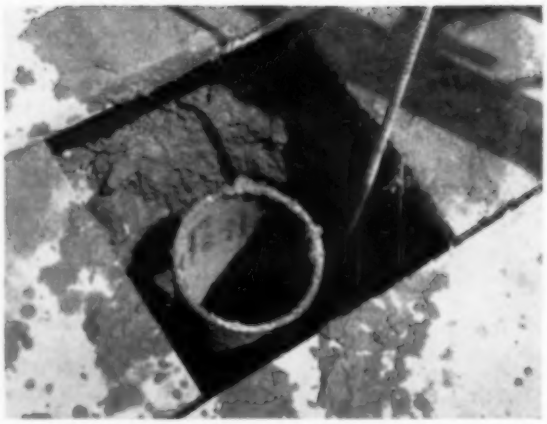
FAST SEALING of water inflow at shafts with minimum material was achieved by mixing fast-setting additive to grout.



STEEL CASING 10 ft long, was embedded with fast-setting grout to serve as guide for drilling grout holes 100 ft deep.

Hanna Developments Cut Shaft-Sinking

- Over-all shaft-sinking cost slashed below contract price.
- Remodeled overburden drill bores holes 150 ft deep without bit wandering.
- Additives cut grouting cost.

UNUSUAL, IMAGINATIVE, PRACTICAL, economical and safe are some of the words that describe the new technique developed by Hanna Coal Co. for sinking mine shafts. In a nut shell, the system includes boring blastholes with a vertical overburden drill, blasting in 9-ft lifts, and removing broken rock with a clamshell on the surface. Applying knowledge gained in sinking the first shaft by this method at Hanna's Glen Castle mine (*Coal Age*, April, 1955, p 74), the company has continually improved the technique.

Six shafts have now been put down by this method, three at Glen Castle mine, in Ohio, and three at the new Ireland mine in West Virginia. Shafts now are sunk up to 160 ft deep and at a saving considerably under contract price. These savings result from use of a minimum of manpower, simplified excavation, a solid shaft wall that needs a minimum of trimming, and application of additives to grouting to seal off water while using a minimum of material.

In planning the new Ireland mine, there were three shafts projected—one for return air, one for intake air and one for an automatic elevator. Success in sinking a shaft 79 ft with the new technique at the Glen Castle mine prompted the company to employ the same method at Ireland mine.

How Shafts Are Sunk

To provide the correct inside diameter for the finished shafts, 8-in holes are drilled around the circumference of a circle, the diameter of which is 2 ft greater than the finished openings. These are spotted on 24-in centers and extend from the surface to the coal bed. The purpose of these holes is to serve as a breaking edge for the shaft and prevent the wall from being shattered by explosives.

The next step is to put down blastholes for breaking rock within the shaft outline. This is done by drilling 10 holes to the coal. One hole is located at the center of the shaft and the others spaced evenly around the circumference of a 12-ft diameter circle. All of the rock-breaking holes are then backfilled with sand. Approximately 10 ft of sand is blown out of each hole with compressed air and then each hole charged with 25 lb of 60% gelatin. The round is fired and loaded out from the surface with a clamshell unit. This sequence is repeated until the shaft intersects the coal.

Since the mucking operation is done from the surface, men are exposed to a minimum of hazards and are down in the shaft only long enough to prepare a shot and scale any loose rock.

The first two Ireland shafts were drilled with a truck-mounted rotary unit because one of Hanna's big overburden drills could not be spared for the job at that time. But one of the Joy overburden drills was brought in to drill the third shaft.

When excavation of surface material began at the No. 2 shaft, water inflow was so great that the company decided to grout the area before going any further. Up to 20 ft of surface material was fill which had been spread over the mine site to bring the mine elevation up to the flood stage of the nearby Ohio River. This unconsolidated fill added to the water problem since it formed no barrier to surface water.

Grout holes were drilled 8 ft away from the perimeter of the shaft on 8-ft centers. Then a 10-ft length of scrap pipe was grouted solidly into each of the 12 holes. A mixture of equal parts cement and sand was used, to which a 50% solution of Sika No. 2 was added to speed set-

WELDER secured collar with 3-in threaded nipple to pipe's opening. Pipe was capped as soon as hole was grouted.

AIR PRESSURE on previously filled hole (left) forces grout in crevices in ground while men funnel grout into new hole.

Costs at Ohio and West Virginia Mines

ting. Initial set took place in 15 min. The dilution of the Sika No. 2 additive slowed down the chemical reaction. The material will set "hard" in 15 sec when used full strength with cement. About 1¾ cu yd of grout was used.

Using the grouted pipes as a centering guide, 6-in holes were drilled to the 40-ft level. A collar with a 3-in nipple was welded to the pipe at ground level for attaching an air hose later on.

The purpose of grouting the pipes in place was to prevent air pressure from blowing the grouting material back up along the space between the pipe and the loose material surrounding it. The pipe in turn was used to assure that all the grout went down rather than sideways in the loose material. The shaft area was then ready for grouting.

Grouting the Surface Material

A mixture of grout containing the fast-setting additive No. 4 was used. This additive sets slower than the No. 2 and was recommended by Sika's Pittsburgh District Manager, R. E. Parlette. A 45-min setting time was established, based on a 50-deg rock temperature and the distance the grout had to travel. An average of one drum (55 gal) of Sika No. 4 was used for every 4-cu yd batch made in a concrete truck mixer. The mix was usually equal parts cement and sand, but in many instances two parts cement to one part sand was used. One-half gallon of Sika No. 4 was used for each bag of cement. Altogether, a little more than 7 cu yd of grout was used to seal off the water in the upper 40 ft.

Grout was funneled into the pipe nipple, filling the casing and flowing into the 6-in hole. When the hole had been filled to refusal, a 1-in air hose with a threaded reducer was attached. Using 75 to 90 psi provided by a mine compressor, the compressed air forced the grout into the fissures of the rock. This sequence was repeated three or four times on some holes and fewer on others. When the ground heaved around the hole it indicated that the grout had set.

Grouting After Sinking

Although the surface grouting sealed off water in the upper section of the shaft, heavy inflow was encountered between the 50- and 100-ft levels. To keep the water from flowing into the deeper part of the shaft during the construction period, a 3-ft-wide water ring level was built around the shaft. This ring consisted of a belled-out section surrounded by a lip at the edge of the shaft lining. Water collected along the concrete bottom of the water ring level and was pumped to the surface through a 12-in borehole located alongside the shaft.

Most of this inflow was sealed off in January, 1958, by grouting down to the 100-ft level. This job was completed faster than the surface grouting to the 40-ft level because compressed air was not needed. The 100-ft column of grout in the 6-in hole created enough pressure to assure penetration of the grout into the crevices. It took 10 cu yd of grout, containing the fast-setting additive Sika No. 4, to seal off most of the inflow of 250 to 300 gpm at the No. 2 shaft.

The feature of this grouting is the use of Sika's fast-setting additive for the first time. Its inclusion made a big difference in the volume of grout used and the cost. Savings on this job are estimated at around $10,000. Grouting under similar conditions has required as much as 3,300 bags of cement.

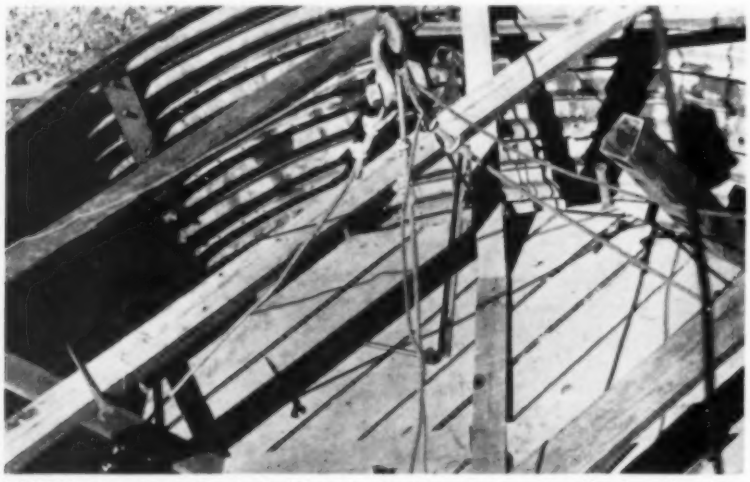
Another advantage of using the additive is that the job can be done with equipment usually found around a mine, or readily obtainable: drill, cement mixer and air compressor. No special pumps are needed.

As a result of the heavy water inflow in the first two shafts, with consequent increase in sinking costs, the company was prompted to try presinking grouting for the third Ireland shaft. It proved very successful in stopping inflow.

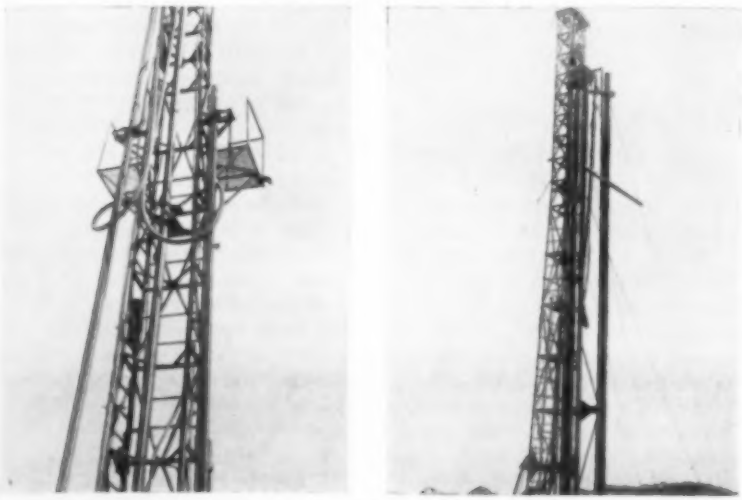
When the blast and shear holes for the third shaft were drilled, water inflow was so great that holes filled to

SPECIAL metal form for pouring shaft lining was designed by Frank Harris.

WORKING PLATFORM is lowered inside form to provide base for bracing.



INSIDE of concrete form looks like this. Working platform provides base for form braces. Upper part of steel wedges of form can be seen.



SHAFT-SINKING DRILL was improved by replacing 4½-in square stems (left) with 8-in round stems and hydraulic rack. Less bit wander resulted.

the surface and could not be bailed out. The rate was estimated to be 200 to 300 gpm. This inflow convinced the company that grouting the area before excavation would be necessary to keep sinking problems and cost to a minimum. Consequently, 12 holes for grouting were put down around a circle 10 ft out from the ring of breaker holes and spaced 10 ft apart. Grouting holes were sunk by first drilling a 10-in hole to bed rock and then cementing a piece of scrap 8-in casing in it. A 6-in hole then was drilled to a depth of 20 to 40 ft, depending on the volume of water encountered. When a 6-in hole was completed, a cap with a 3-in pipe nipple in it was welded to the top as in the previous surface grouting.

Grouting proceeded by filling alternate holes one at a time with grout made up of 1:1 mixture of sand and cement in which Sika No. 4 quick-setting additive was mixed. The air line from an air compressor was attached to the pipe nipple and air pressure at 70 to 90 psi forced the grout into openings in the rock. The 8-in casing served as a grout reservoir and was refilled if necessary.

As soon as a hole was completed, a cap was screwed onto the 3-in pipe nipple to prevent the possibility of grout being pushed out of the pipe while another was being filled. It was necessary to fill only 10 of the 12 holes.

How Additive Is Used

To get quick setting and control the travel of the grout, the Sika No. 4 additive was mixed with sand-cement grouting. The company was particularly anxious to prevent the grout from flowing to and filling the shear holes which outlined the shaft. To detect the distance grouting traveled, red concrete coloring material was added to the grout in the first several holes. The red color showed up in the water in the shear holes and was found bubbling up in a nearby stream. Even though the red color was detected in the water in the shear holes, the company found that the quick-setting grout was not filling the holes but was coming just to them. This controlled flow was exactly what was wanted. As excavation took place, the company found that the pregrouting had practically sealed off all the water. This was in decided

contrast to the first two shafts which had such large inflows that the cost of sinking was greatly increased.

The cost of the third Ireland shaft was considerably less than the bid by an independent contractor using conventional methods. It took 372 manshifts for excavating and lining the shaft. Work on the shaft started Aug. 1, 1957, and was completed Nov. 15.

Improving the Drill

After the third Ireland shaft was drilled, the Joy overburden drill was moved to the Glen Castle mine in Ohio to sink holes for a 105-ft shaft. Water inflow at this site was so great that the drill was operated as a water unit. When this job was completed the drill was taken to the company's central shop at Georgetown to be remodeled.

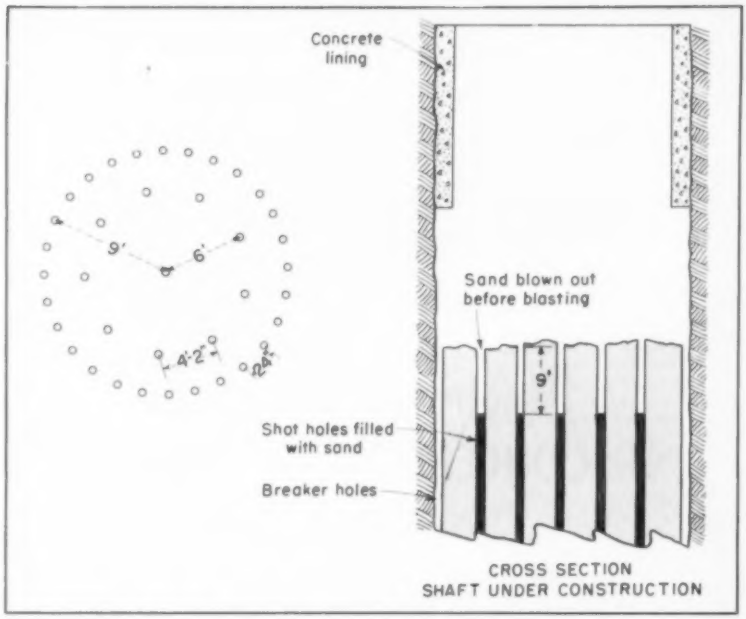
The revamping job included replacing the 4½-in square stem with an 8-in round one, adding a hydraulically powered rack for additional drill stems, and installing a new drive head.

As a result of rebuilding the drill, more air flows through the drill at lower pressure. Because of the increase in air volume, cuttings come out better. This is possible because of the 4-in opening in the new stem, compared to the 1½-in opening in the old one.

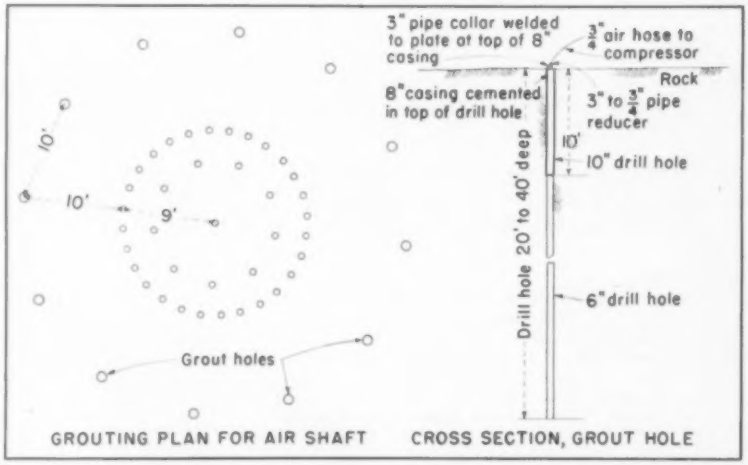
All stems now are changed from the platform, thus eliminating the need for the drill helper to climb up the mast each time a section is added. This feature saves 67% of the time formerly needed for adding or removing a section of drill stem.

Another significant benefit is that the drill stem and greater flow of air hold back any inflow of water while a hole is being drilled. Thus a normally wet hole is drilled as if there was no inflow. The company reports that although the wet holes are drilled like dry ones, they fill up with water over night.

Perhaps the most significant benefit from the remodeled drill as far as shaft sinking is concerned is that holes can be sunk over 100 ft deep with little or no drift from the vertical. This was proved at the last shaft sunk at Glen Castle with the blasthole technique. None of the holes cut together and the walls did not have to be trimmed as with the other deep shafts. This was the first time that no trimming was needed. Another benefit resulting from the straight holes was a savings of 88 cu yd of concrete because no voids had to be filled.



DRILLING PLAN for shaft excavation calls for outlining shaft with breaker holes and then sinking 10 blastholes to coal. Rock is broken in 9-ft lifts.

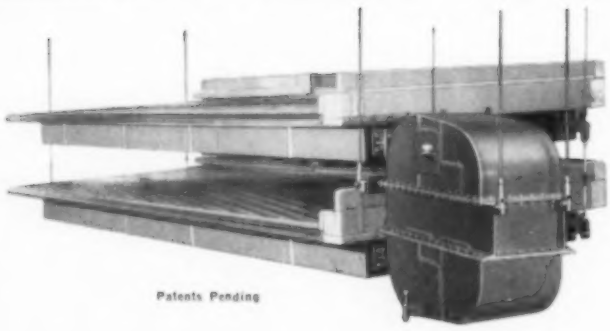


GROUTING PLAN for sealing off water flowing into shaft requires grout holes around circle 10 ft from edge of shaft. Air pressure pushes grout into voids.

Special Forms Speed Pouring

Pouring the concrete liners for the circular shafts was simplified with a metal form designed by Frank Harris, retired Hanna construction foreman. The form was made from an 8-ft section of Armco corrugated tunnel liner 16 ft in diameter. To provide a smooth form, sheet iron was attached to the outside of the liner. Then, to simplify installation and removal, the form was cut in half and two 8-in wedge sections made. A 1-ft piece of 3/8-in sheet steel was welded to each side of the wedges so that a 7-ft mine roof jack could be used to spread the form for inserting the wedges. When the form was spread in the proper position, the wedges were secured to the form with six bolts.

At the Ireland shafts an additional band of metal was welded around the upper 12 in of the form. This per-



Patents Pending

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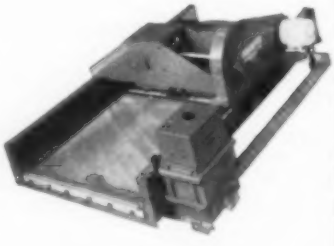

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mitted the form to slip down inside the previous pour and also simplified insertion of the wedges.

At the more recent shaft jobs at Glen Castle, the form was altered somewhat. Instead of welding the steel band around the top of the form, a 1-in taper was made in the form. When the tapered form was reassembled it slipped 6 in inside the previous pour.

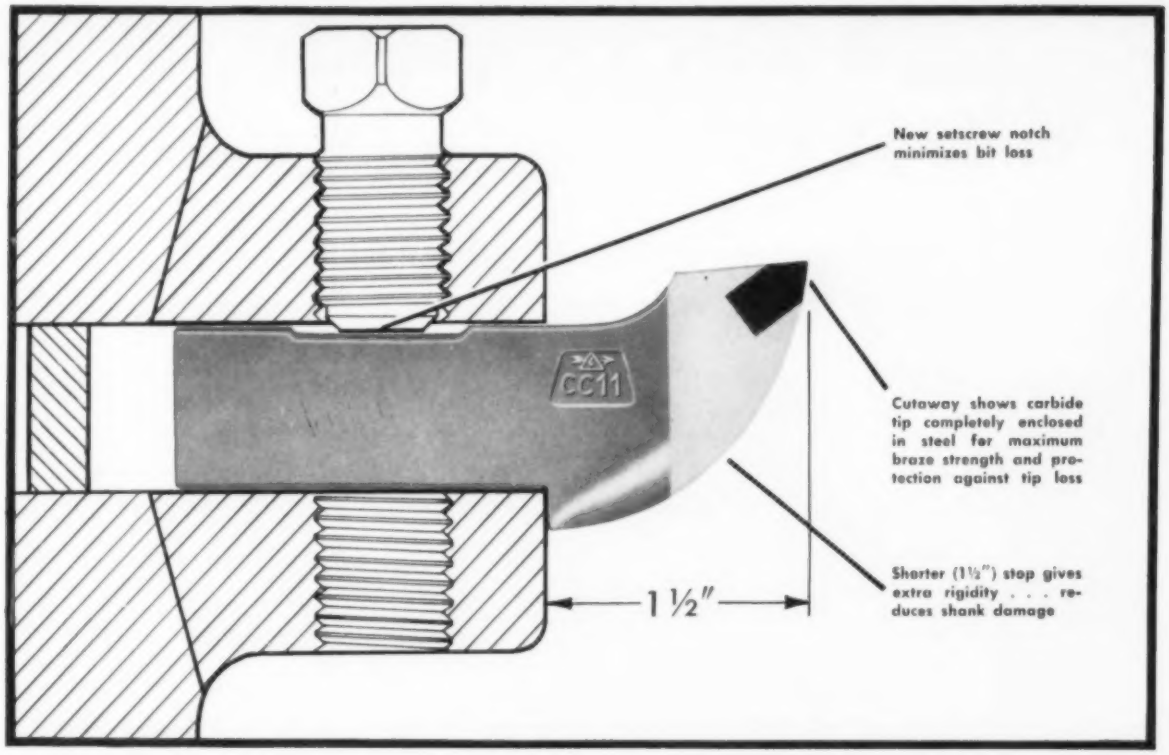
Stiffening of the form was done as follows. A wooden platform was lowered into the form and suspended from four wire ropes anchored midway in the form. In addition, four more ropes with ratchet hoists were connected to wire-rope loops clamped to four suspension ropes anchored at the surface. Loops were spaced so that the ratchet hoists could be used to spot the form in position for the next pour. Bracing inside the form was provided by 2x6's and 2x2x¼ angle.

Concreting the Shafts

Concrete pouring was done in two stages. At Ireland the shafts were sunk approximately 70 ft, the form installed at the bottom of the opening and the lining poured from the bottom up. Three men installed the form and completed a 7-ft section in a shift. When the first 70-ft section was completed, the lower half of the shaft was excavated and the liner poured from the coal seam up to meet the first section.

At the newest shaft at Glen Castle, excavation and lining were done in two stages. Before the concrete work was started in the upper part of the shaft, eight 4-in pipes were placed in the shear holes. These extended from the surface to the coal and were installed in pairs equidistant around the shaft circumference. Four of the pipes were for future pumping of mine water and four were for carrying concrete to the lower section of the lining. Four more 4-in pipes, also equally spaced around the shaft, were placed for pouring the upper 42-ft section of the lining. A funnel-shaped hopper was added to top of the pipes to simplify pouring.

After each pour, a 7-ft section was cut from the end of the concrete carrying pipes. A joint strip of 16-gage iron was placed in the concrete after each pour was made. Using ready-mix concrete trucks, it took 30 min to make a 7-ft pour.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CC11
Cutaway shows carbide tip completely enclosed in steel for maximum braze strength and protection against tip loss
Shorter (1½") stop gives extra rigidity . . . reduces shank damage
1 ½"

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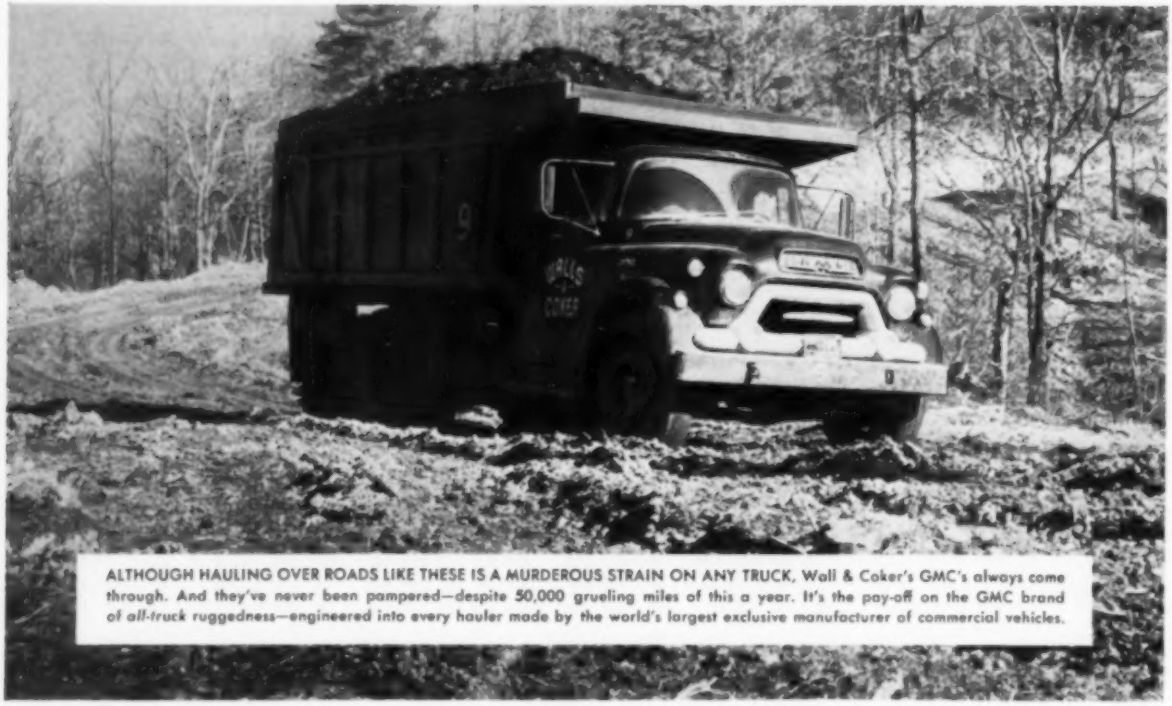

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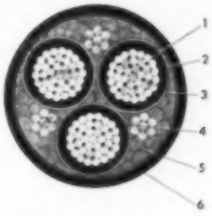

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FIG. 1—CAST-STEEL TOOTH (top) was rebuilt for more use. Welded tooth (bottom) consists mainly of steel plate.

FIG. 2—WELDED TOOTH is made of parts in foreground. Tack-welded assembly is at upper right and tooth at left.

Improved Bucket Teeth Cut Costs

Longer digging life and lower maintenance costs result from a change to welded teeth for dragline buckets at Northern Illinois mine.

STRIP MINING at Northern Illinois mine, Peabody Coal Co., Wilmington, Ill., is a large operation done with heavy equipment involving a substantial investment. Keeping such equipment in good working order requires a sizeable maintenance shop, as well as portable repair units. Arc welders are of prime importance in such maintenance and are in constant use.

Coal seams up to 90 ft below the surface are exposed by Marion 7800 draglines having buckets of 25- and 30-cu yd capacities. Slate, sandstone and other highly-abrasive materials are handled. Consequently bucket teeth take a beating, and their repair and replacement are a major factor in overall maintenance.

For a long time, commercial cast manganese-steel teeth were used on the buckets. Wear was quite rapid, but, by welding on new points and making other build-up repairs by arc welding, a total life of about 56 days (24 hr each) of digging time could be attained. New teeth of this type cost about $68 each, and the need for repairs and replacement of occasional losses further increased the total cost.

An important factor in remedying this situation was the development of a new design for these teeth. Parts of this new type are shown in the foreground of Fig. 2. In the right background is a tack-welded assembly, and at left is a completely arc-welded assembly with beads of hard-surfacing on the flanks, this assembly being one repaired after use.

All five components are flame-cut from U. S. Steel's Carilloy T-1 plate, that for the flank portions measuring 4x9¼ in on the face and 1½ in thick. The roughly-triangular web is cut from 1⅛-in plate. This is a tough, high-strenth alloy possessing good abrasion resistance, and it is easy to weld. The plates are flame-beveled to provide grooves for weld beads.

Plates are received in heat-treated and quenched condition and parts cut from them retain their properties despite flame-cutting and welding operations. Moreover, preheating before welding or normalizing of weldments are not required. Welding with L-60 low-carbon automatic wire electrodes yields excellent joints.

The cast parts in Fig. 2 are produced from a special alloy of a composition similar to that of the steel-plate parts. Bevels are left for beads to be applied after the parts are tacked together. A wedge driven through the holes in the slotted casting forming the adapter base and in the web plate hold these parts together until they are welded. Later, the hole receives a pin that fastens the tooth to the bucket lip, the pin being bent over so that it cannot come out in service. This fastening prevents the loss of teeth.

After a set of tooth components is prepared, they are clamped together for tack welding. Usually this is done for a full set of teeth, with similar weld passes being made in succession on each tooth of the set. This gives the pieces time to cool between the applications of successive beads, thus preventing warping from heat. After tacking with an iron-powder, low-hydrogen electrode, the assemblies are mounted on a shaft driven into the hole and are set in bearings supported on a stand, as in Fig. 3. This shaft rests in trunnion bearings that make it easy to turn the assembly into the most convenient welding position.

Counterweights, one of which is

FIG. 3—SUBMERGED-ARC WELDING is used to finish-weld the tacked assembly, using a wire electrode and flux from cone.

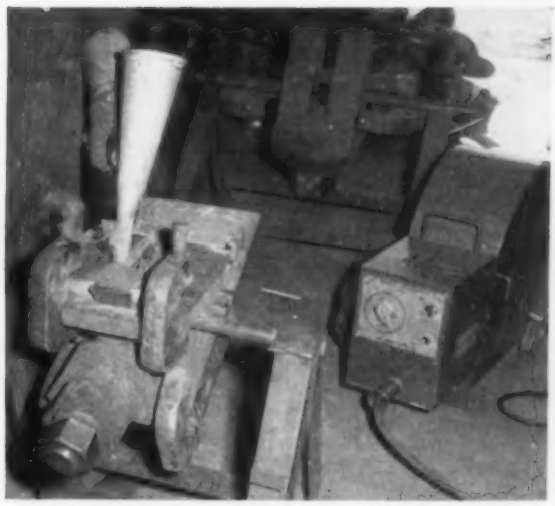


FIG. 4—SUBMERGED-ARC WELD is laid down in V-groove between components of a tooth resting in holding frame.

shown in Fig. 4, help to balance the assembly, but the shaft is clamped with a T-bolt after it is set in the desired position. All welds, save tacking, are produced with a manual submerged-arc unit, shown in Figs. 3 and 4, the gun being held and guided by hand. Mildsteel (L-60) wire, 5/64 in, feeds automatically through the gun and No. 760 flux feeds from the cone to cover the arc.

This setup is employed for several reasons. Welding is much faster than with coated rods; a much higher current density is applied, insuring better penetration; the operator need not wear a mask since the arc is covered by the flux, and there is no spatter. Futhermore, rapid welding helps to avoid warpage, and the fused flux is easily removed leaving a clean surface for successive beads. Welds of higher quality than those produced in hand welding are a result.

Several passes are needed to fill the V-grooves, but the welds provide an unusually sturdy assembly capable of long service. Total cost per tooth approximates $60, material and labor included, which is less than cast manganese-steel teeth, and the welded teeth show longer service life and need fewer repairs. Hardsurfacing beads are welded onto the new teeth before they are placed in service. They can be used for 21 8-hr shifts without repairs.

Total life of the cast teeth averaged 56 digging days, as mentioned.

FIG. 5—THIS SET OF NEW TEETH for dragline bucket was economically rebuilt after being worn down to the condition of the one shown at the right.

The new teeth have a life of about 200 digging days. Both are repaired periodically. A considerable annual saving results. Both the cast and welded types require hardsurfacing beads to attain adequate resistance to wear. These beads are built up with the same equipment used in making the new teeth. Fig. 6 shows a group of the newer teeth for a 32-yd bucket, after repairs, and a similar tooth, at right, before repairs.

When teeth need new points, they are applied with the Lincolnweld "Squirt" welder, after the old point has been burned off with suitable bevels. Most build-up and hardsurfacing operations are done with the Squirt welder, using the same mildsteel wire as for original construction but employing H-545 flux which contains alloying elements that produce hard beads having abrasion resistance equal to that of the parent metal. Additional beads along the flanks of the teeth are applied by hand welding, using a semi-automatic electrode that affords still higher abrasion-resistance.

Experiments have been conducted in which the hardsurfacing bead is applied in a chevron or herringbone pattern, as on the repaired tooth at the left in Fig. 2. It is believed this pattern will reduce gouging of metal from tooth flanks, further reducing the cost of tooth upkeep. Savings with the new teeth have been such that the use of similar teeth has been extended to five mines.

Are You Preparing *Now* For The Next Boom?

America's leading companies are not sitting on their hands waiting for the recession to end. They are planning ahead ***now*** for higher sales and near-capacity rates of operation.

These facts stand out clearly from the eleventh annual survey of Business' Plans for New Plants and Equipment just completed by the McGraw-Hill Department of Economics:

- **Manufacturing companies expect their sales to increase 20%, on the average, from 1958 to 1961.** Growth industries, such as chemicals and electrical machinery, expect gains of 25% to 34%.
- **If these sales gains are achieved, the average rate of operations in manufacturing will rise from 78% at the end of 1957 to almost 85% by 1961.** This is the point at which pressure on costs begins to mount, as less efficient facilities are pressed into service.
- **Industry is not waiting for this point to begin getting its plants and equipment in shape for the next boom.** Despite record expansion in the past several years, many manufacturing companies plan to add new capacity in each of the next four years. But, more important, they are going ahead with the vital job of modernization and cost-cutting.

In the years immediately ahead almost two-thirds of capital investment will go for modernization and replacement of present plants and equipment. In this way manufacturing companies can avoid the higher costs and the squeeze on profits that occur when producing facilities are not in shape to handle an increase in sales volume.

These are the plans, as reported to McGraw-Hill, of a wide sample of manufacturing companies—for the most part, large firms and leaders in their respective industries. Altogether, these firms account for almost 40% of all employment in manufacturing industries.

Now Is The Time

How do your plans measure up? Are you planning ahead now for a 20% sales increase in the next three years? Is your company planning to modernize its buildings and equipment more rapidly than at any time in the recent past? If not, here are some of the inducements

that McGraw-Hill editors report from their continuous checking on the state of business.

(1) **There are plenty of opportunities for increasing efficiency by the installation of new equipment and the improvement of layouts in plants, warehouses and offices.** Despite the installation of tremendous volumes of metalworking equipment in recent years, according to AMERICAN MACHINIST over half of the machine tools now in U. S. factories are over 10 years old. Replacement of worn-out and obsolete equipment will mean material savings in operating and maintenance costs.

(2) **Machinery, parts, materials and labor are much more readily available now than they are when the economy is running at full steam.** You can be more particular about quality and about specification to meet your own requirements.

(3) **With lower interest rates and less competition for loans, it is both easier and cheaper to borrow money to finance equipment and construction.** To wait for another boom is to run the risk of having to pay higher interest rates and look harder for money.

(4) **Although there is an adequate supply of most types of labor available now, the prospect is that the supply of factory labor over the years ahead will be tight.** In 1965, there will actually be fewer men and women between the ages of 25 and 44 than there are now. Good factory workers will be either hard to get, or wage rates will rise sharply or—more likely—both. The best answer is to anticipate the rise in labor costs by installing more efficient equipment to increase labor productivity.

(5) **Finally, the costs of investing in new buildings and improved equipment *now* are almost surely less than they will be later.**

These are some of the reasons why many leading firms find ***now*** the best time in years to start on a program of plant modernization. There are other good reasons in the many new products and processes coming from the boom in research and development. This year industry will spend over $8 billion on R & D—$1 billion more than in 1957. And a heavy share of the new product development will consist of better machines and processes to be made available during the next few years. Already the pace of technical advance is so rapid as to call for modernization of plants built only a few years ago.

Years of Opportunity

It has been said that the years between now and 1961 are the "middle years" between two booms. This does not mean a long period of recession, but a period of slower growth—a transition from the postwar boom based on deferred demand, to a new boom in the 1960s based on dynamic population growth and a revolution in technology.

If so, these are the years of opportunity for business—opportunity to prepare for the growth that lies ahead with the most efficient equipment, the most modern plant and the best production organization that can be devised. This is the way to fight higher costs and avert a resumption of inflation. This is also the way to ensure that your company will be ready for its new markets in the 1960s.

Are you planning ahead ***now*** to be among the leaders?

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw
PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

FEATURED LUNCHEON SPEAKERS: Dr. Clyde E. Williams (left), former president and director, Battelle Institute, spoke on "Research for Industrial Progress," and J. T. Ryan Jr., president, Mine Safety Appliances Co., on "Research in the Exotic Fuel Age." Dr. Williams was introduced by R. R. Hughes, president, Clinchfield Coal Co., and Mr. Ryan by W. L. Wearly, president, Joy Mfg. Co.

From Research to Sales

BCR annual convention stresses research as key to progress and long-range expansion of markets.

HOW TO GET THE MOST for the research dollar and prospects for growth in industry research and sales were dominant themes at sessions of the 1958 Annual Meeting and Techno-Sales Conference held by Bituminous Coal Research, Inc., April 23-24, in Pittsburgh, Pa.

Highlighting the convention program, A. A. Potter, BCR head, presented the BCR Annual Award to Luther C. "Bud" Campbell, coal mining consultant and former vice president, Eastern Gas & Fuel Associates. The award is given "for outstanding leadership on behalf of industry-sponsored research," (*Coal Age*, May, 1958, p 32).

Technical session chairmen were W. W. Bayfield, executive vice president, American Coal Sales Association; Charles F. Spencer, administrative assistant, Pittsburg & Midway Coal Mining Co.; and S. B. Johnson Jr., president, Lorado Coal Mining Co. The following are abstracts of the 14 talks and papers presented by technical- and (above) luncheon-session speakers:

Utilization and Sales

Problems in Introducing New Coal-Using Equipment, J. R. Garvey, director of research, Bituminous Coal Research, Inc.

At least 90% of research and development time required in introducing a new product on the market is spent in overcoming all sorts of new and unexpected difficulties to assure satisfactory commercial performance.

In developing new equipment, representative coals are first tested in the laboratory under simulated field operating conditions. If laboratory results are favorable, the investigation is extended to field installations where from 1 to 50 units may be placed in operation.

The greatest value of field testing equipment is to find out what modifications are necessary to widen the range of coals that it can use. Especially important to field adjustments and modifications are adequately-trained personnel who can recognize what changes are necessary and who are competent to make them.

Prospecting for New Coal Consumers, Carroll F. Hardy, managing director, Bituminous Coal Institute.

The key to the coal industry's commercial and small industrial markets—the area in which Bituminous Coal Institute concentrates its efforts—is the continuing education of fuel consumers, directly and through their professional consultants. The time for that educational effort is NOW—at the moment everyone is more dollar-conscious than a year ago.

INDUSTRY MEETING
A Special COAL AGE Staff-Written Report

In prospecting for new coal consumers, the heart of the BCI program is its widespread field activity. At present, there are 17 district engineers and managers contacting consumers directly in 44 coal-burning states. Last year, over 9,000 personal calls were made by the field staff, then consisting of 12 men. Their efforts, however, were multiplied many times over by BCI district advisory committees (representing coal producers and retailers), equipment manufacturers and railroad men.

One of the goals of the BCI cooperative effort is to get so many coal and related-industry men talking up modern coal burning that engineers, architects and consumers will automatically think first of using coal. This goal has been partially achieved. Consumers and engineers are now asking for BCI service, and this trend should grow as time goes on.

When you can convince a consumer that coal can help him produce more of a better product cheaper, you have hit paydirt. This is what BCI, within the cooperative framework of the coal industry, will keep right on doing.

How to Sell the Commercial and Small Industrial Market, E. H. LaRue, vice president and general sales manager, Princess Coal Sales Co.

With the proper approach and acceptance of responsibility by the in-

dividual retail merchant or producer salesman and by industry-wide promotion groups, a tonnage potential of 65 million tons can be realized in the commercial and small industrial market.

The individual retail merchant or producer salesman should:

1. Determine exactly the type of plant and customer his coal will fit.

2. Provide dependable supply for the specified period.

3. Follow through with trouble-shooting service whether or not problems involved are caused by coal.

In approach and responsibility, the industry should continue and expand co-operative programs of BCR, BCI, ACSA, ACI and the newly formed High-Volatile and Low-Volatile Coal Exporters Associations.

The Importance of Coal Preparation to Coal Utilization, Chas. H. Sawyer, Eastern Gas & Fuel Associates.

By and large, the coal industry is doing a good job in providing the customer with a clean, properly-sized, uniform product.

Greater customer satisfaction, however, can be achieved through further improvements in the prepared product. And to do this, "we need to continue to work with every user of bituminous coal and with their equipment suppliers so that beneficiation can be held to economical levels without sacrifice in use values."

Further improvements require two basic efforts. On the one hand, it takes industry-wide research such as that conducted by Bituminous Coal Research. On the other hand, individual companies must keep "eternal vigilance" on their preparation output. In the final analysis, this is the surest way to obtain the best possible results from all the fine equipment available in 1958.

Markets for Coal in the Metallurgical, Chemical and Other Process Industries, R. A. Glenn, Bituminous Coal Research Inc.

The magnitude of future markets for coal in the metallurgical, chemical and other process industries will depend in large measure upon the ingenuity and effort applied to the task by the coal industry itself.

At present, about one-fourth of the bituminous coal consumed annually in the U. S. [123 million tons in 1957] is used for non-fuel purposes.

Coal for coke production [high-temperature carbonization] may rise from 108 million tons in 1957 to between 129 and 157 million tons by 1975, according to a forecast of the Paley Report.

Much larger tonnage-increase potentials are in prospect for other non-fuel uses as new and improved processes are developed for converting coal to chemicals. These processes include low-temperature carbonization, gasification, hydrogenation, extraction, hydrolysis and oxidation.

The Paley report, for example, estimated that 150 to 175 million tons of coal will be gasified directly to make synthetic liquid fuels and ammonia. Also—when economics are favorable—about 8 million tons of coal will be needed to replace each 1% of present natural gas consumption as supplies of this fuel decline.

A comprehensive survey of future potentials for coal markets in non-fuel uses has been completed and will be distributed to BCR members.

The Impact of Electric Heating on Power and Coal Consumption, R. G. MacDonald, vice president-marketing, West Penn Power Co.

"Coal by Wire" for home heating furnishes the opportunity for coal to regain a market that has largely been lost, and the opportunity for the electric industry to obtain a market that it has never had. A recent nation-wide survey of electric utilities indicated that most are now either starting or planning to start active promotion of this market.

Electric industry predictions show that, by 1960, there will be a million electrically-heated homes. By 1970, electric heating will be found in 40% of all new homes and these will consume more than 70 billion kwhr of electricity annually [requiring some 28 million tons of coal]. This, of course, is only the beginning. In the offing is a potential for 50 million wired homes which would require 375 million tons of coal annually. And such estimates do not include other residential uses of service—cooking, water heating, clothes drying, etc.—which, in all probability, would also be acquired.

Much smart planning and hard work will be needed to realize the promise of this market. Coal should join forces with the electric industry in all-out promotion efforts to win the support of labor and management, the positive interest of building contractors, architects and home buyers, and the full cooperation of the insulation industry and equipment manufacturers.

The 1958-1959 Outlook For Coal Sales, V. M. Johnston, Appalachian Coals, Inc.

Although the second quarter may prove to be the "trough" of the decline, it may take until the fourth quarter for the Nation's economy to generate some economic speed. The delay in recovery, therefore, makes it necessary to scale down estimates of coal production in 1958 and 1959 as follows:

	Millions of Tons		
	1957	1958	1959
Electric power utilities	157.4	159.0	168.0
By-product ovens	104.6	85.0	100.0
Beehive ovens	3.3	1.0	3.0
Steel and rolling mills	7.0	6.5	7.0
Cement mills	8.6	9.0	10.0
Other industry	88.6	80.0	90.0
Retail deliveries	35.7	33.0	33.0
Railroads	8.4	5.0	4.0
U. S. CONSUMPTION	413.6	378.5	415.0
Canada	18.5	15.0	17.0
Overseas export	57.9	41.0	43.0
USE AND EXPORT	490.0	434.5	475.0
Stocks, etc	—0—	−8.0	+5.0
PRODUCTION	490.0	426.5	480.0

BCR Elections

Three new members elected to the 15-man BCR board are **Tim E. Hollandsworth,** president, Guyan Eagle Coal Co.; **Joseph Pursglove Jr.,** vice president—research and development, Consolidation Coal Co.; and **Wilfred S. Webster,** vice president and general manager, Walter Bledsoe & Co.

Five board members reelected are **R. E. Dean,** assistant to the president, Ayrshire Collieries Corp.; **R. H. Hughes,** president, Clinchfield Coal Co.; **E. P. Humphrey,** president, Stonega Coke & Coal Co.; **C. R. Mabley Jr.,** president, Island Creek Coal Sales Co.; and **C. F. Spencer,** administrative assistant, Pittsburg & Midway Coal Mining Co.

The remaining seven members of the board are **L. C. Campbell,** former vice president, Eastern Gas & Fuel Associates; **A. A. Potter,** president, Bituminous Coal Research, Inc.; **R. L. Savage,** vice president, North American Coal Co.; **L. N. Thomas,** president, The Carbon Fuel Co.; **J. E. Tobey,** president, Appalachian Coals, Inc.; **W. J. Tuohy,** president, Chesapeake & Ohio Ry. Co.; and **H. C. Woods,** chairman of the board, Sahara Coal Co.

Newly elected officers are **J. W. Igoe,** secretary and treasurer; and **D. P. McCloskey,** assistant secretary and assistant treasurer. Both Mr. Igoe and Mr. McCloskey retain their present BCR responsibilities as director of administration and assistant to the director, respectively. In their new posts, Mr. Igoe succeeds **C. A. Reed** and Mr. McCloskey, **J. F. Hanley.**

Dr. A. A. Potter was reelected president; **J. E. Tobey,** first vice president; and **Dr. H. J. Rose,** vice president and consultant.

BCR Reports

Cooperative Coal Research on the Increase, A. A. Potter, president, Bituminous Coal Research, Inc.

Recent reports show that successful industries are spending an average of 8% of each sales dollar on research, development and engineering. The same industries acknowledge that 75% of their current business is derived through research on products unknown 10 yr ago.

Recognizing this fact, the bituminous coal industry and its friends have encouraged BCR to plan a major research facility at Pittsburgh, Pa., which will consolidate present activities now located in Columbus, Washington and Pittsburgh. The new undertaking is an "industry move" and is another indication of the vision and progressiveness which for many years has increased productivity through mechanization and without outside subsidy.

The Mining Development Program, Gerald von Stroh, director of development, BCR Mining Development Program.

Despite the depressed conditions of the coal industry, the Mining Development Program will have the largest operating budget in its history during this fiscal year. With the continued aid and guidance of practical operating representatives, the program should help to make the industry healthier, safer and more profitable.

High on the agenda for study or development are projects (1) to advance the output of continuous mining machines through automation of face operations, (2) to develop devices for automatic detection of methane and roof failure, and (3) to devise a system for instantaneous ash and moisture analysis which will permit the production of a more uniform product from preparation plants.

Other active projects include such items as face transportation, temporary roof support, permanent roof support, sealing of airways, dust control, mainline haulage, liquid-filled motors, rock dusting and soil stabilizers. In many instances, these projects reflect support from manufacturing concerns.

Locomotive Development Program, P. R. Broadley, director of research, BCR Locomotive Development Program.

With the completion of the 1957 test program, locomotive-sized coal-fired gas turbines have been run a total of 5,010 hr. Operation time in 1957—at load factors far in excess of normal locomotive operating practice—amounted to 1,103 hr. "The general operation of the plant was more satisfactory than in any previous testing program."

Operating economies continue favorable to the coal-fired gas turbine. However, "at a meeting of the Locomotive Development Committee held November 13, 1957, it was concluded that the current business recession would not permit the Locomotive Development Committee subscribers to appropriate the funds necessary to implement the recommendations of the Operations Committee and the Mechanical Advisory Committee.

"Sufficient funds have been allocated to place the operation on a 'standby' basis wherein the key personnel are retained and the test unit 'white leaded' until further funds are available."

Research Solves Coal Use Problems, J. R. Garvey, director of research, Bituminous Coal Research, Inc.

During the past year, BCR introduced three new units of coal-burning units which are now being sold:

1. The International-BCR Coal-Pak Automatic—a completely automatic coal-fired packaged steam or hot water generator for commercial or industrial use.

2. The Fire-Jet Burner—an automatic coal-fired stoker for commercial use.

3. The Coal-O-matic Furnace—an automatic, warm-air, hot-water, or steam unit for residential use.

A fourth equipment unit is now being manufactured for commercial and industrial use—the BCR Easy-Flo Bin, a bin discharge device which unloads coal or other bulk solids without arching, funneling or rat-holing.

In the laboratory are such projects as the following: in-plant pneumatic coal handling, electrostatic cleaning of coal, and continuous determination of moisture in coal. Two projects which will be jointly investigated by the electric industry and BCR are new processes for decreasing sulphur in steam coals and methods for control of flue-gas emissions.

In cooperation with the Commonwealth of Pennsylvania, BCR is making a study of coal plasticity to provide a sounder basis for designing coal-burning equipment and to predict the performance of specific coals in combustion units.

Coal Research in Europe, Harold J. Rose, vice president and consultant, Bituminous Coal Research, Inc.

Europe has concluded that its economic health in the next generation will depend fundamentally on coal for fuel.

In recognition of this fact, Western European and Soviet Bloc countries have more than 10,000 persons engaged in coal research and development activities. This is more than four times the number so engaged in the U. S.

More than half of all European coal research personnel are in Soviet Russia, which has a crash program to develop 309 new coal mines with an added annual capacity of 265 million short tons by 1960. Therefore, it is likely that Russia will soon displace the U. S. as the world's leading producer of coal.

If the U. S. is to meet this challenge and to hold its 50-million-ton export market, adequate support must be provided at once for coal research and development.

Featured Talks

Research for Industrial Progress, Dr. Clyde Williams, Clyde Williams and Co.

Research is now a necessity if an industry is to participate in the continuing growth of the Nation's and possibly the world's economy.

In this participation, however, wise selection of projects and careful programming of execution, are essential if research is to continue to succeed as it has in the past.

Teams of men should do the planning —men who know science, technology, markets and business in general. This planning should place great emphasis on a carefully-considered research program wherein the "payoff" will play an essential part.

"I would rather see you spend 60c on planning and preliminary study and 40c on execution to achieve a dollar's results than I would see you spend 10c on planning and 90c on execution to end up with 40c of goods."

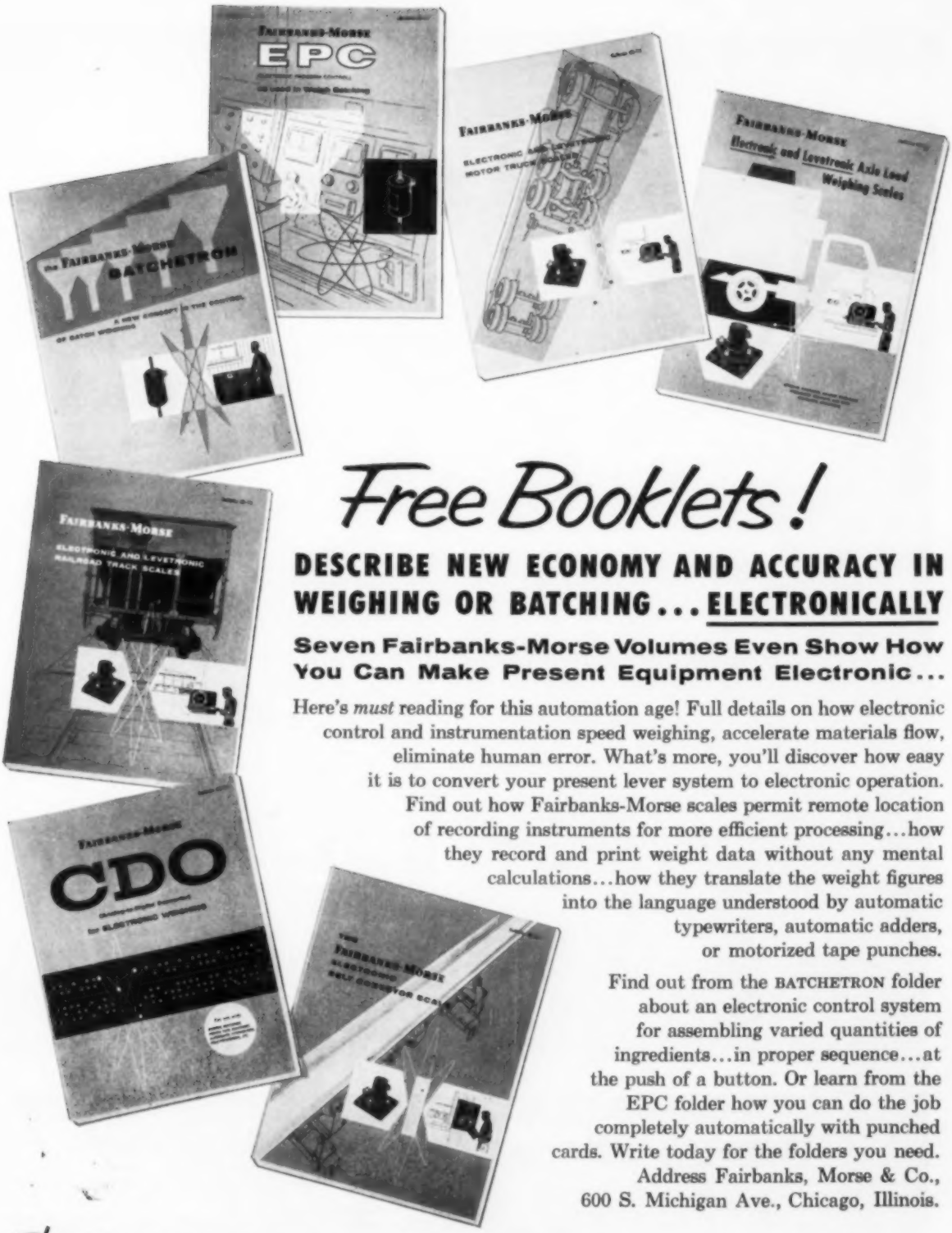
Once the planning is done, every project should then be "big," adequately financed and executed with brains, ability and constant supervision. Bituminous Coal Research can provide these indispensable ingredients.

Research in the Exotic Fuel Age, John T. Ryan Jr., president, Mine Safety Appliances Co. and chairman of the board, Calliery Chemical Co.

Calliery Chemical Co.'s experience in developing "Hical"—a new high-energy fuel for jet aircraft and missiles—has strengthened our conviction in the vital importance of basic research.

Calliery Chemical Co. got into the high-energy fuel business because "two of our people met me in the mail room one evening in June, 1947, and asked for funds to conduct some basic chemical research. Several of Calliery's scientists had seen great possibilities in boron chemicals but their wartime work prevented any comprehensive investigation. They had no specific product in mind—only an idea—only the belief that they had the germ of what could be an important discovery.

"The annals of industrial research are rich with examples of fundamental discoveries which cost a few thousand dollars in their original conception but which cost millions to bring to production and to practical, useful results. Penicillin is one example. Nylon and cellophane are others. I will testify now that HiCal is still another."



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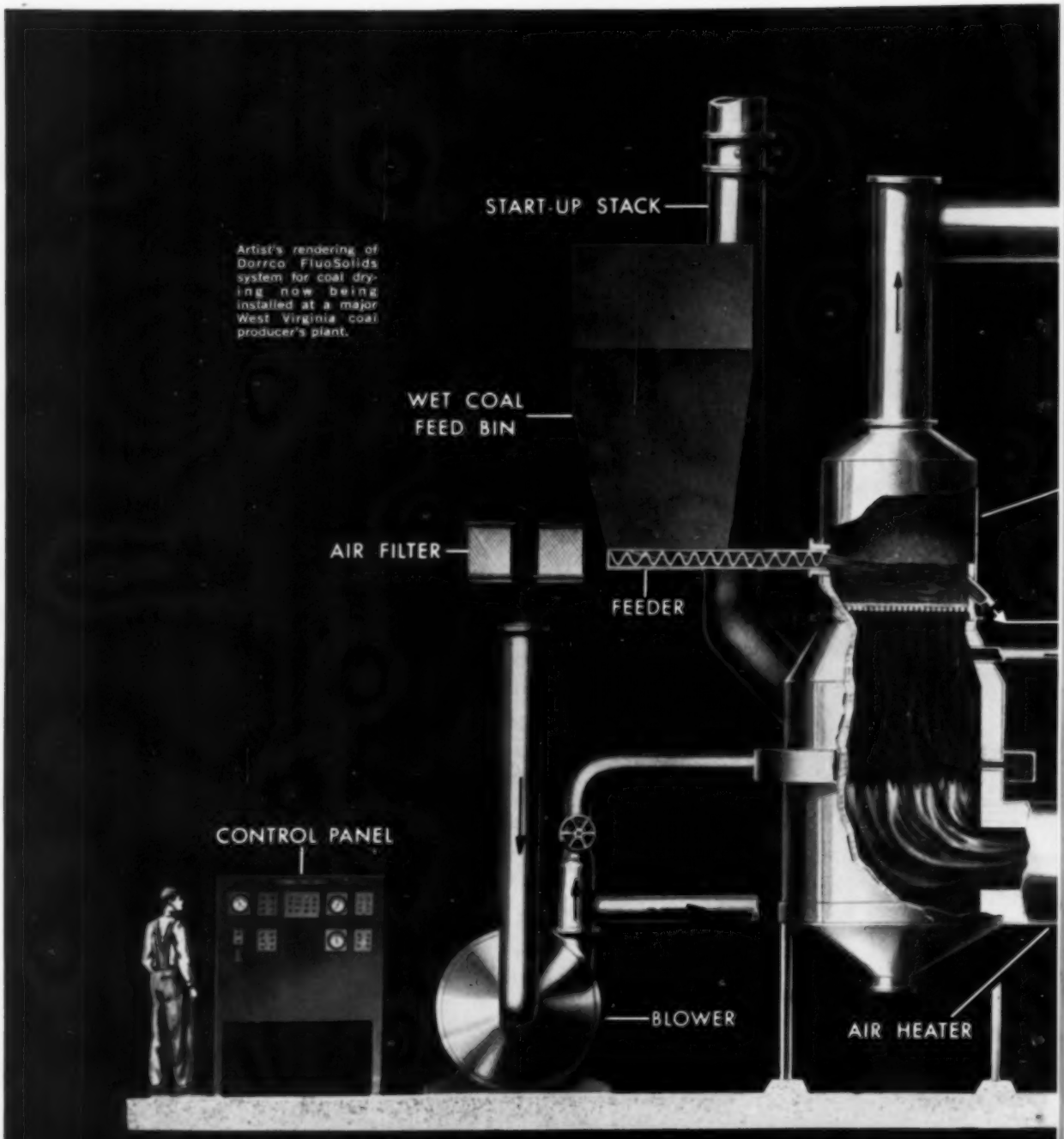


Artist's rendering of Dorrco FluoSolids system for coal drying now being installed at a major West Virginia coal producer's plant.

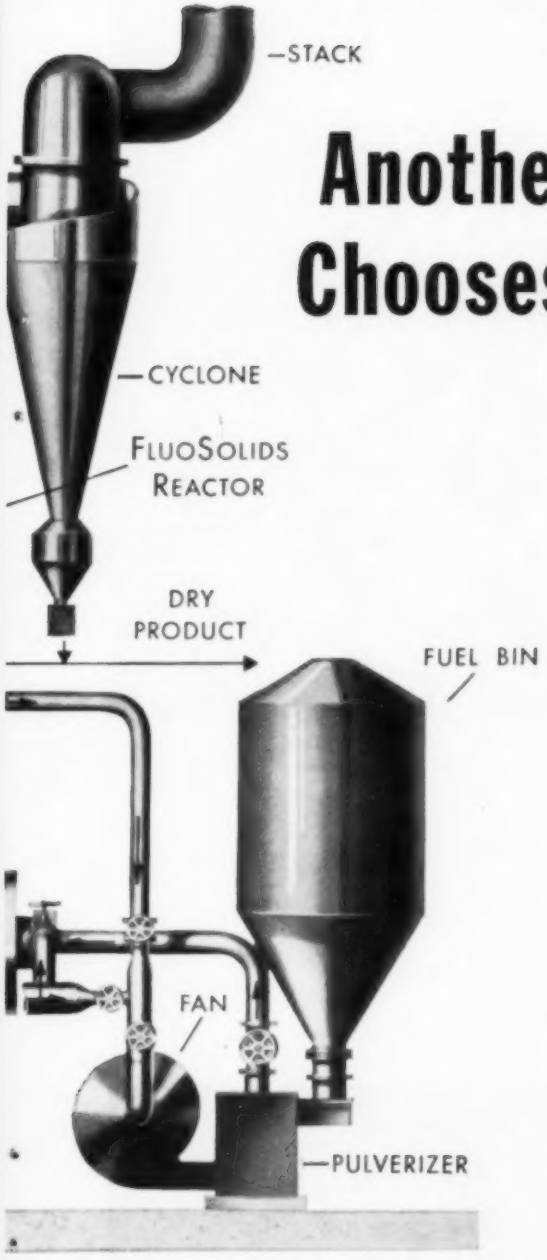
What is the FluoSolids system?

A VALUABLE NEW TOOL FOR DRYING, SIZING AND HEAT TREATMENT. When particles are suspended in an upwardly moving stream of gas, the entire dense mass behaves much like a liquid and is said to be fluidized. Applied to coal drying by the Dorrco FluoSolids system, fluidization results in a new and more efficient drying technique, in which the intense mixing action of the fluidized bed instantaneously transfers the heat from preheated air to the wet coal. A combination of reactor, blower, cyclones and other auxiliary equipment forms a complete processing system, adaptable to a wide range of drying, sizing, roasting and heat treatment applications.

HELP FOR YOUR PROBLEM:

If there's a step in your process where intimate contact between solids and gases is required, fluidization should be investigated. Dorr-Oliver will be glad to work with your research and development men, run pilot plant tests at our laboratories, or cooperate in any other way to insure a realistic evaluation in terms of your particular needs.

Dorrco and FluoSolids are trademarks of Dorr-Oliver Incorporated. Reg. U. S. Pat. Off.



Another Leading Producer Chooses FLUOSOLIDS Drying

After several years of investigation into all methods of tonnage coal drying, a leading West Virginia coal producer recently ordered a large Dorrco FluoSolids coal drying system. Scheduled for start-up in late 1958, the FluoSolids drying system is the major part of the thermal drying plant. The system is designed to remove 17 tons of water per hour in a single 12′ diam. Reactor from a wet feed of 233 tons per hour of $\frac{3}{16}$″ x 0 coal.

The first Dorrco FluoSolids system for coal drying has been on stream for nearly three years, and with the advent of this new start-up the number of systems in operation will total four—cumulatively drying almost 1200 tons per hour of coal—significant proof of the industry's acceptance of Dorr-Oliver's fluidizing techniques.

For the complete Dorrco FluoSolids coal drying story—and how application of the system can benefit your plant operation—write to Dorr-Oliver Incorporated, Stamford, Connecticut.

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OVERFLOW CROWDS were the rule at technical sessions and special-feature meetings of the 1958 American Mining Congress Convention at Netherland Hilton Hotel, Cincinnati, Ohio.

American Mining Congress Cincinnati Convention Themes . . .

Methods for Today, Research for Tomorrow

HOWARD I. YOUNG, president, AMC, opens convention. James C. Gray (left), vice president, U. S. Steel Corp., was chairman of program committee. J. W. Woomer, J. W. Woomer Associates, headed floor committee.

GEORGE M. HUMPHREY, JOHN L. LEWIS exchange greetings as Mr. Lewis moves to address convention at special luncheon. Mr. Humphrey, chairman, National Steel Corp., introduced Mr. Lewis to AMC delegates and guests.

FUTURE PROGRESS through basic and applied research and continuing day-by-day increases in efficiency through the application of known and tested fundamentals were keynotes of speakers at the meetings of the American Mining Congress, Cincinnati, Ohio, May 4-7. Over 1,700 delegates at the technical sessions heard speakers describe and project the latest techniques in all phases of deep mining, stripping and coal preparation. Following are abstracts of all papers.

Research for Progress

The Human Side of Research, Dr. W. H. Alexander, Pastor, The First Christian Church, Oklahoma City, Okla.

The coal industry must work to make its dreams come true and to fulfill its heritage as part of a progressive, free-enterprise system. Necessary to the achievement is a personal philosophy of life which stresses wholesome attitudes and constant effort to make positive contributions to our economic, social and religious well-being.

This is the only way to combat the "most perilous age in history"—most perilous because totalitarian ideologies, negative thinking and military weapons contain the seeds of self-destruction such as the world has never known before.

Even though things look dark, be not afraid—God's might is still the most powerful if it is recognized and practiced in daily personal and business living. "If we will be true to the principles and ideals that made our country great, we will share in God's dreams for humanity."

Research in the Coal Industry, Dr. A. A. Potter, president, Bituminous Coal Research, Inc.

European nations have more than four times as many personnel in coal research and development work as the United States. Over 3,000 persons are so engaged in Western Europe, and there are believed to be more than 5,000 doing similar work in the U. S. S. R.

Note also: The U. S. spent about $17 million for bituminous coal research during 1955—compared to expenditures of $146 million by the petroleum industry and $361 million by the chemical industry.

The coal industry produces and markets a commodity which is essential to national welfare and security. For coal to participate fully in the ever-increasing energy demand of this country and the world, vigorous coal research and development programs must be developed and carried out. Research is the lifeblood of any basic and progressive industry, and it is highly essential to insure any industry's ability to meet constantly increasing competition. BCR, as the research organization of the bituminous coal industry, must assume responsibility for the generation of short-range and long-range programs in the interest of coal's future (*Coal Age*, June, 1958, p118).

Strip Mining

Two Seam Stripping and Parting Removal, Frank Gilbert, superintendent, River Queen Mine, Peabody Coal Co.

Concurrent stripping of two coal seams has been made possible at Peabody Coal Co.'s River Queen mine, Greenville, Ky., by using a specially designed shovel equipped with a 145-ft boom.

The huge shovel of 55 cu yd capacity —one of the largest pieces of movable land-mounted equipment—is used to remove an average of 43 ft of sand-rock and shale overlying the top seam as well as the 11 ft of limerock and shale between the two 5-ft seams.

The shovel rests on the lower seam and removes the upper overburden from the side, swinging about 180 deg to deposit the spoil. Also, by digging straight ahead of itself, the shovel removes the "parting" rock betwen the two seams and deposits it to the side. Ammonium nitrate is used to blast the overburden and prepare it for removal by the shovel.

The exposed coal is loaded by 9-cu-yd loaders into 50-ton capacity pneumatic-tired haulers which transport the raw coal to the preparation plant.

Developments in Ammonium Nitrate Blasting, Robert L. Akre, superintendent, drilling and blasting, Maumee Collieries Co.

Since their introduction in 1954, the use of blasting agents compounded of prilled fertilizer-grade ammonium nitrate and a small percentage of carbonaceous fuel has become well established in strip mining. Virtually every stripping operation is using, in some degree prilled ammonium nitrate, either packed in water-resistant, expansible-plastic bags, in asphalt-laminated or polyethylene-lined burlap bags, or merely as a mixture prepared at the borehole and poured down.

The accumulated experience of users of AN-fuel blasting agents, however, is now beginning to bring out not only its definite advantages but also its limitations. The advantages of premixing and of a packaged product have been demonstrated where careful supervision and attention to good blasting principles have been practiced. With further experience, the advantages of higher-density-AN-blasting agents will become more evident, particularly where hard shooting is encountered. More experience will also show the best primers as to size, shape and type of explosive, considering both economy and safety as well as perform-

John L. Lewis Speaks On . . .

. . . Government and Coal

". . . there is no industry in the United States that is taken so for granted to such a degree by the government as the coal industry. It is . . . left to its own resources, without aid or reasonable assistance in expanding its markets or overcoming its scientific problems of research."

. . . USSR in World Markets

"It's a reasonable assumption—and the weight of logic would cause one to conclude—that Russia doesn't want a killing war with the United States. . . . They don't believe they have to resort to war to gain the economic objectives which they proclaim and declare, and which they are pursuing diligently. . . . Russia wants more coal to barter in the world markets, in mass volume, to displace the world markets of American coal. Russia is moving to eventually gain control of the oil deposits in the Arab states. As she concurrently develops her coal industry, she will eventually get to the point where she has an exportable excess. With economic control over that coal and political control over Near-Eastern oil, her position in the world of barter will be improved . . ."

. . . Voice for Coal

". . . There is a need in the industry for a central organization—non-technical—to deal with our national problems, the public interest and the overall questions incident to continued existence. . . .

"I think the industry needs a forum, which to some degree exists in other industries, where all segments of our industry could come to discuss, to debate and to conclude on matters of major public policy and the acute problems that confront the industry.

"The United Mine Workers of America will be glad to support and cooperate with such an agency. . . . This agency would be the voice, not only of the investors and management of the industry but also the manpower of the industry.

"That voice, I assure you, would be much stronger and more effective on the things upon which we could agree than the voices raised heretofore."

—Excerpts from address to American Mining Congress, Cincinnati, Ohio, May 5.

ance of the prill-oil blasting product.

Strip operators should continue to review overall blasting costs closely because, in many instances, even further economy can be achieved in overburden removal costs by proper selection of the blasting agent and method of use.

The Hanna Ammonium Nitrate Blasting System, James Hyslop, president, Hanna Coal Co.

Fatal experience with liquid oxygen led to an experimental blasting program to find a method which would give maximum safety, adequate fragmentation and displacement of rock overburden at low cost. The program resulted in the development of an apparently superior blasting system involving the use of a mixture of oil and prilled, clay-coated ammonium nitrate.

The system consists of using prills of proper specification coated with ½ of 1% of anti-caking agent. Two mixtures of oil are used: A relatively small quantity of a 2% mixture for maximum sensitivity in the priming charge, and 6% in the main charge. The 6% mixture in the main charge is necessary to get a maximum explosion equal to the power of about 123% of TNT.

To the 2% priming charge, we attach a 60-grain size prima cord which is wrapped tightly six times around a waterproof bag to impart a high rate of detonation to the main charge.

It is possible to modify the system by using a 6% mixture exclusively. In many cases, this mixture can be satisfactorily detonated but reliability in blasting is reduced, and, if dampness or other adverse factors are present, a misfire or inefficient blast may ensue.

One of the striking features of our system is that practically no smoke is made in the blasting and we believe that smoke is an important indication of the efficiency of an ammonium-nitrate-oil-mixture blast.

The system was tested in 8-inch holes but modifications can be made for use in smaller diameter holes, possible down to 1 in.

The material has been submitted to the USBM for safety tests. Field testing is still in progress and patents have been applied for. At the proper time, the system will be made available to the industry.

Current Practices in Anthracite Stripping, A. E. Coddington, vice president, Carey, Baxter & Kennedy, Inc.

For a number of years, the anthracite industry has been annually obtaining a larger percentage of its production from open-pit mines. The main reason behind the trend is the lower cost of production. In 1956, the average production throughout the anthracite region was about 3.90 market tons per man-day, with open pits producing about 7.48 tons per man-day while the underground mines averaged about 2.48 tons per man-day.

Among the latest advances being used in anthracite fields are ammonium nitrate for blasting, improved blast-hole-drilling equipment and techniques, larger and more powerful bulldozers and rippers, and front-end loaders for handling coal. All these practices are factors in helping to achieve the lower costs that are necessary if anthracite is to maintain a favorable price differential in the highly competitive space heating field and to expand its markets in the industrial field.

Much of the success of strip mining in the anthracite region must be attributed to the willingness of operators and contractors to adopt new and more efficient equipment and practices, and to the manufacturers and suppliers who constantly strive to improve their products.

James R. Bazley, vice president, J. Robert Bazley, Inc.

Other practices which are currently contributing to lowering the price of a ton of raw anthracite coal are:

1. The building of large breakers at central locations.

2. Pre-cleaning at stripping pits or mine openings. This is done to avoid the cost of transporting raw coal to the central breaker which contains large amounts of vein refuse and other waste material.

3. Greater emphasis on cutting down-time through two-way radio communication, preventive maintenance, and airplane deliveries of repair parts.

Continuous Mining from Strip Highwall, A. D. Henry, general superintendent—strip mines, The Powhatan Mining Co.

In spite of the mammoth stripping shovels in use, most companies eventually reach a height beyond which it is not profitable to strip and, as a result, tracts of coal under high cover varying in size from a few to several hundred acres remain unmined. This waste and loss of deep coal reserves prompted Powhatan to conduct experiments with continuous mining equipment under highwalls which had been stripped to about 80 ft of cover.

Following many changes and improvements in equipment and the mining plan, we have progressed from doubtful success in 1956 to profitable operations. Results for the last 5 mo of 1957 and thus far this year are much better than for 1957 as a whole. At present, we are producing at an average of 360 tons per 8-hr shift, with a face labor cost of 70c per ton and a bit cost of 5.5c per ton. Output is running 31 tons per man-shift.

Changes and improvements have included a better organized, higher-quality mining force, construction of an elevating conveyor with a large power-driven belt reel to expedite shifts to new mining areas, and addition of standby equipment, especially a spare continuous miner.

Developments in Strip-Mine Haulage, Robert G. Bunch, partner, Bunch Construction Co.

Model L. R. S. W. Mack trucks are doing a good job of hauling coal for the Boone County Coal Corp. The big 35-ton trucks are equipped with short wheel bases and hydraulic steering which is necessary in the short turning area within the strip.

The main-haul road and the secondary roads are constructed so that the grades will be between 10 and 15%, and never more than 18% if possible. To handle these grades, the trucks are equipped with 10 large tires, hydrotarders for auxiliary braking, the Mack Power-Divider differential system, and air-assisted clutches with high-capacity transmissions. Power is supplied by Cummins 300 hp engines.

William C. Laidlaw, production engineer, Enos Coal Mining Co.

The efficiency of the modern coal preparation plant requires an even, uninterrupted flow of raw coal if the operator is to maintain a consistently marketable product, less coal in the refuse, and a high-rate of man-hr output. To meet these needs as preparation plant capacity expanded, Enos coal management (1) acquired additional loading and haulage equipment, and (2) increased utilization of present equipment by enlarging storage facilities.

An additional 3,000 tons of storage capacity was found necessary to eliminate preparation plant down-time and insure improved continuity of pit operations. Further advantages of the increased storage were derived by replacing six 44 cu yd tractor-trailer units with three new 61 cu yd units. The six smaller units operating one shift provided 264 cu yd of haulage capacity. With new storage bins in operation, the three 61 cu yd units operating two shifts now provide 366 cu yd capacity. The three new units acquired were Autocar A. P. 25 tractor-trailer units. The complete new set-up—storage and haulage units—has reduced tipple down-time to a minimum.

Ernest Bruns, president, Bolt Mining Co.

The versatility of modern coal-hauling equipment has made it possible to solve the problem of difficult mining conditions and to establish a profitable operation at Bolt.

The problem was quite characteristic

of many strip operations in West Virginia and, perhaps also, in other parts of the country. The coal is at an elevation of 2,600 ft while the railroad or delivery point is down in the bottom of the valley. Our mine is located in rough country—about 850 ft above the dump. Topography made it necessary to gain this elevation in 2.5 mi, with an average grade of 6.7% and pitches up to 7.5 and 9%.

Tractor-trailer haulage units were equipped to handle the adverse topographical and weather conditions. Equipment included oil retarders for auxiliary braking, tire chains on drivers, and NoSpin differentials. Using this equipment, it is possible to negotiate grades in either direction and in just about every kind of weather. Loaded, downgrade speeds average better than 20 mph on the main haul road. Empty coal haulers return at an average speed of 15 and 16 mph.

Average production using five haulage units is about 2,000 tpd. Total costs—based on the cost-per-ton mile for total ownership and operating costs—is about 5.5c per ton mile. The average haul for 12-mo. periods in 1957 and 1958 was 5.8 miles.

Total direct costs for building the mainline haul road averaged about $64,000 per mile. Road costs, which include the coal dump and crusher installation costs, are being written off at a rate of 4c per ton of coal.

Lowell E. Copeland, president, Beckley Coal & Coake Co.

Kenworth-Marion and Dart tractor-trailer units have reduced our haulage costs over conventional tandem trucks by 80%, and 35 to 40% over 25- to 40-ton bottom-dump haulers. Road requirements, furthermore, have been about the same. Tractor-trailer units are of bottom-dump design and have a truck capacity of 90 cu yd.

From railroad tipple to mine storage bins, the company has one haul of 7.5 mi, then a continuation of the same haul road to a distance of 10.5 mi. A difference in elevation of 700 ft must be overcome to reach the mines. This is accomplished by climbing upgrade at from 6 to 8%, a distance of 2.5 mi, after which the road is almost level to the mines. Snow and ice during winter months have been overcome by use of abrasives on the roads and chains on the haulers.

Martin R. Heckard, superintendent, Rapatee Div., Midland Electric Coal Corp.

Our new coal hauler—LeTourneau-Westinghouse Model L. W. 80—has proven very satisfactory in making it possible to carry the greatest payload with the least possible empty weight. It has also provided great economy in fuel, tire and maintenance expense.

With land relatively level in the prairie country of Central Illinois, the haulage problem consists of lifting the coal from the pit to the top of the surrounding countryside from where it is taken over high-speed roads to the plant. The roads are now 55 to 60 ft wide, having an average grade of 1 to 2% and a maximum grade of 2½%. Road construction permits all-weather use and load capacity up to 250,000 lb.

A major consideration in selecting the model was to avoid sacrificing strength or life expectancy. We feel this goal has been reached. The tractor and trailer, each weighing 31,000 lb, have a combined weight of 62,000 lb. The box has a capacity of 100 cu yd, or 160,000 lb of coal, thus providing over 2.5 lb of payload to each pound of empty vehicle weight.

Underground Power

Evaluating and Selecting AC Power Systems for Underground Mining, C. R. Huffman, staff electrical consultant, Donegan Coal & Coke Co.

Experience at seven AC-powered deep mines, with different supply and face voltages and transformer connections, suggest evaluation in designing AC systems of the following factors:

Under ordinary conditions, overhead lines will cost only one-third to one-half the investment for underground cable systems. Neglecting right-of-way costs, but including clearing, overhead 33- and 22-kv lines will cost about $8,500 per mi and 12-kv lines from $6,000 to $6,500 per mi. In selecting service voltage it would be desirable to make it high enough to work out the property at loads of 2,500 kw and more and transmission distances in excess of 2 mi. The voltage should not be less than 13,200 V. Whether distribution should be overhead, then transformed and taken underground, depends upon such factors as (1) size of mine and system of mining to determine number and size of power-supply locations required; (2) relative cost of overhead lines, considering typography and surface uses of the land; (3) depth of cover and cost of boreholes; (4) cost of access roads and weather conditions as they might affect inspection of isolated service facilities.

Other necessary safety measures include the use of resistance-grounded neutrals in transformer circuits, adequate lighting protection and remote-indicating oil circuit breakers at isolated substations.

In formal discussion of Mr. Huffman's paper, David L. Hamilton, application engineer, General Electric Co., Schenectady, N. Y., pointed out that effective earthen grounds are difficult to establish in the mine and that the resistance-grounded neutral, connected to all units through solid copper connections, is the safest way. Voltage regulation is one of the major problems in AC use underground, and ways must be devised to keep this regulation within narrower limits. Better data on load and diversity factors also are needed to aid selection of substation equipment. Starting large motors contributes to excessive regulation, as does jockeying of AC-powered shuttles cars under the discharge booms of loading machines or continuous miners. Now available from equipment manufacturers is a fail-safe indicator to show that the ground conductor is intact within the power cable.

Operating Experience with AC Power, J. H. Sherrard Jr., chief engineer, and Andrew Rusnak, maintenance supervisor, Johnstown Coal & Coke Co.

Comparison of nine 12-BU sections on DC power with nine on AC power shows repair-cost breakdown at current prices on traction motor for loading machine, as follows:

DC motor:	
Armature rewind	$ 82.00
Commutator	118.00
Main fields, set	62.30
Commutating fields, set	48.80
Brushholders, set	21.10
Brushholder studs, set	8.35
Brushes, set	3.04
Total	$ 343.59
AC motor:	
Stator, rewind	$ 65.00
Rotor, new	40.00
Total	$ 105.00

In addition to this material cost difference of $238.59 per motor, the labor on the DC unit will require more time, further increasing the cost. In 3 yr of Colmol operation, there have been four AC motor failures and two DC motor failures. Of the four AC failures three resulted from mechanical failure of fan blades which encountered and damaged stator coils. Two armature burn-ups of the same DC motor on a Colmol cost more to repair than the four AC failures. There are no fatalities built into AC systems, but safety supervision over both AC and DC must be 100% intense. All factors considered, the best power system available to the coal industry today is 3-phase, 60-cycle AC with a minimum phase-to-phase potential of 440 V.

Selection of AC Distribution Equipment, John A. Stachura, general superintendent, Enoco Collieries, Inc.

One of the problems confronting the coal industry in attempting to utilize

some of the new equipment available today is the fact that operators in many states are faced with the problem of being limited by statutory limitations based upon experience with DC, particularly as to voltages. Permissible AC utilization voltages in various states range from a low of 240 V to a high of 650 V. In distribution systems, neoprene type G shielded cable has been most satisfactory for underground distribution of high voltage. It is lighter and easier to handle, splicing and terminating are simpler, potheads are often unnecessary, electrolytic and chemical corrosion are reduced, and moisture does not affect insulation. In the secondary cable system one of the best time and money savers is a recently-designed quick connector, and the development of a dependable, easily carried fault-finder has also contributed to greater economy. At Enoco, compact nitrogen-filled transformers are installed as close to the face as possible, but in some instances 1,500 ft of secondary cable have been used without serious effect on face voltage. Installation of capacitors at the main substation has increased power factor to above 99%. The capacitor installation paid for itself in 3 mo through better power rates and improved operating efficiency.

Coal Preparation

Fine-Coal Preparation and Closed-Circuit Operation, M. C. Chang, research mineral engineer, Crucible Steel Co. of America.

A change to trackless mining at Crucible mine, Crucible, Pa., introduced difficulties into the fine-coal circuits in the preparation plant. A buildup of slimes in the circuit was one of the worst of the problems, and this was further complicated by the fact that topography makes it impossible to create a silt pond of sufficient capacity to handle these slimes. Original scheme had been to treat slurry in H&P cyclones in parallel with a 75-ft Dorr thickener. The underflow of these units was filtered, with the cake going into the clean coal and filtrate and thickener overflow recycled to the coarse-coal plant. First solution was to operate cyclones and thickener in series. The cyclones recovered the coarse particles and high-ash fines overflowed to the thickener where a flocculant was added. Later a froth flotation circuit was added to clean the underflow of the cyclones. The flotation product is filtered and reject is discharged into the thickener. Overflow of the thickener now is recycled to main plant without a burden of slimes. Thickener underflow is filtered, with cake going to refuse and filtrate recycled. Latest addition to the system is 24-in cyclone to recover 28x10-mesh coal and further improve performance in the fine-coal circuit. No data is available on the operation of this new unit. Results of plant changes include (1) improvement in coarse-coal washing and filter cake quality, (2) improvement in product quality, uniformity and yield, (3) easy control of circulating water density and viscosity and (4) establishment of a closed water circuit.

Benefits of Reducing Circulating Solids, J. J. Reilly, coal-preparation superintendent, Vesta-Shannopin Coal Div., Jones & Laughlin Steel Corp.

A buildup of solids in circulating water can put an entire cleaning circuit out of control and the uniformity and quality of the product suffer. In searching for a solution, it is necessary to determine the type of material causing the buildup, and to analyze this material to see wasted or recovered. The system should be studied to locate the point where the solids can be best concentrated for treatment. The operator must strive for maximum economical recovery, based upon what he can sell. The load of fines now coming to preparation plants has increased as a result of full-seam mining and continuous mining. At the Vesta mines of J&L it was determined that the unwanted fines consisted of a 30% concentration of minus 14-micron high-ash clay. A first attempt to solve the problem was to pump to waste a 2% fraction of the raw-coal feed, amounting to from 400 to 600 tpd. This resulted in a reduction to 20% in the circulating solids. Cyclones, filters and 150-ft thickeners were added to reduce the solids to 14%. A further step was to direct the overflow of the larger thickeners into an 85-ft thickener with flocculant which produced a clear overflow. Not the least of the benefits is that the plant complies with clean-streams regulations.

Pumping of Solids in Coal Plants, Paul Levin, project engineer, Allen & Garcia Co.

Among factors to be considered in designing systems for solids pumping are specific gravity of solids, size of materials and pipeline velocity, all interdependent factors. However, where long pipelines are involved, any increase in pipeline velocity results in a very large increase in power and maintenance costs. Examples of acceptable pipeline velocities are (1) 12 fps in a system designed to handle 100 tph of ¾x0 refuse at a concentration of 20% solids in an 8-in line; (2) 13 fps in a 10-in line handling 150 tph of 1x0 refuse at a flow of 3,200 gpm. Line velocities of about 10 fps are common for pumping ¼x0 coal, and velocities of 6 fpm for finer solids. Solids-handling pumps require a source of clean water for continuous flushing of the packing glands. The pressure must be high enough to cause flow from the packing into the pump. Duplication of facilities will be advantageous in many instances in order that operations may continue while pump maintenance is conducted. Pipelines for the transportation of solids should be laid out with minimum changes of direction, and the pipe should be rotated at intervals to equalize wear. In critical pipelines which might be choked in the event of power failure it may be desirable to incorporate dump valves. In pump maintenance it should be recognized that local eddys trailing from a worn spot in a pump may seriously accelerate the erosion. Prompt attention to these bad spots will forestall serious trouble later.

Recent Advances in Coal Thermal Drying, Frank R. Zachar, consulting mining engineer, Morgantown, W. Va.

Characteristics of a good thermal drying system include (1) an ample supply of hot gases near the critical temperature of the coal, (2) a minimum retention time of the coal in the dryer to achieve adequate evaporation, (3) maintenance of exhaust gases at a temperature high enough to prevent condensation prior to leaving the dryer, (4) ability to treat a relatively wide range of sizes without overdrying, (5) a method of insuring intimate contact of the coal with the drying gases, (6) high throughput of coal, (7) high thermal efficiency, (8) a design that will keep maintenance to a minimum and (9) simplicity of operation and control. Available types of coal dryers were described with respect to principles of operation and with major emphasis on instrumentation and control methods. The drying field, considering choice of units, is not so limited as it was in the past, and an operator has an opportunity to investigate a number of units before selecting the one he feels is best suited to his purpose.

Reducing Coal Preparation Costs Through Automation, George H. Morris, preparation engineer, Indiana Div., Peabody Coal Co.

Victoria, River King and River Queen mines of Peabody Coal Co. are loading from 6,000 to 9,000 tons of coal per 7¼-hr shift with all loading chutes and car movements under the control of a single operator at each mine. (See description of equipment and methods in *Coal Age*, January, 1958, p 87).

There has been a substantial reduction in preparation costs over and above the labor which has been eliminated. At one mine an average of 100 hr per month was lost as a result of ground stops in the loading operation, before the new system was installed. These stops for

the most part were caused by (1) cars not rolling when the retarder was released, (2) the car rider came down too fast, knocking cars from under loading chutes or damaging retarder and (3) weather and clean-up delays. With the new car-hauls almost all these losses have been eliminated.

The quality of the coal has been improved by the elimination of ground stops which caused the plant to shut down. Plant shutdown adversely affects cleaning, heat drying and blending. Safety has been improved since from three to five men have been eliminated from coupling and climbing. This situation was especially dangerous during cold, rainy or freezing weather.

Advances in the Art of Dense-Media Cleaning, Emery O. Milligan, preparation manager, Freeman Coal Mining Corp.

One process that promises a great future is the comparatively new application of cyclones to heavy-medium cleaning of fine coal. A true gravity separation takes place within the cyclone itself. Material ranging from ¾ in to 35-mesh can be effectively cleaned at a feed rate of 50 tph in a 20-in cyclone. Magnetite is reclaimed from the clean-coal overflow and refuse underflow of the cyclone. The feed is prepared in a pulping tank and fed at constant head to the cyclone.

Automatic specific gravity control by the use of diptubes has proven satisfactory. The principle is that when a diptube is submerged in water a certain pressure is required to make the air escape. Pressure increases with depth of submergence. When applied to a liquid having a density higher than that of water, the pressure required is in proportion to the density of the liquid. When two diptubes of different length are employed the difference in air pressure in the two tubes is proportional to the specific gravity. This difference in pressure is relayed to a recorder. The recorder then is linked to pilot and needle valves which admit medium as needed to keep the system at a preset state of balance. This frees the operator from testing and he can give all his attention to the mechanical operation of the plant.

A Prediction of Future Demands by the Electric Utility Industry in Coal Quality, R. H. Wolin, assistant chief engineer, Combustion Engineering Co., Inc.

Utility and industrial companies are looking more and more closely into the over-all cost of coal in terms of cost per pound of steam generated rather than in cost per ton delivered to the plant. The coal industry therefore, should recognize that upgrading coals must be looked at more and more intensely. Large, expensive and efficient steam generating units are only as good as their availability; their availability and overall efficiency are greatly affected by operating and maintenance costs, and the quality of the fuels burned has a great influence on these items. Every coal producer has some measure of control over the quality of his product in that he can eliminate part of the ash, the sulphur and the alkalies in it.

For best and most efficient steam generation, the operators of any large unit should know what coals are being burned all the time. Different coals require different amounts of air, require different burner and damper settings, more or less frequent use of soot blowers, and coals which for one reason or another do not run uniform in a plant, lead to poor operations. Part of the problem could be solved by blending the poorer coal with better grades.

The utility companies are becoming more cost-conscious in regard to coal. A study by a mid-western utility indicated that there is as much as 25c per ton difference between operating cost of an average coal and the cost of one of the lowest-grade coals, which represents 5% of the price of the coal. A coal which is a few cents a ton cheaper delivered at the plant may prove many cents a ton more expensive when a strict record of operating and maintenance costs are kept.

Research on the Nuclear Irradiation of Coal for Use with Diesel Fuel, Ray McBrian, director of research, The Denver & Rio Grande Western Railroad Co.

Under contract with the Atomic Energy Commission, the Rio Grande in mid-1955 sent samples of crushed coal to Brookhaven National Laboratory for gamma irradiation, which reduced the coal into particles small enough (1/25,000 of an inch or less) to be successfully dispersed in fuel oil. Since the Btu content per pound of coal is about the same as that per pound of fuel oil, the lower cost of coal can make possible a considerable price advantage favoring a mixture of coal and fuel oil.

Rio Grande's research department is continuing detailed basic research on the mixture for the purpose of securing patents on an economical and satisfactory method of preparation for actual use in diesel engines. A possible savings of one cent per gallon of fuel oil would total at least $400,000 in one year's operation of Rio Grande's dieselized main line.

Continuous Mining

Continuous Mining in Thin Seams, W. J. B. Mayo, division manager, Eastern Gas & Fuel Associates, Melcroft, Pa.

At Melcroft mine (Lower Kittanning seam) 7-man crews using Colmol 76-AM machines produce 36 tons per man shift in coal which ranges from 28 to 48 in thick. In conventional sections average productivity is 18 tons per man shift. Equipment in the continuous-mining sections includes the Colmol, a pickup loader, bridge conveyor, room conveyor, mother conveyor, elevator and mine cars.

At Sonman mine (Upper Freeport seam) 6-man crews produce on an average of 35 tons per man shift in continuous-mining sections, against 17 tons per man shift in conventional sections. Approximately 65% of the mine output is mined by the continuous machines in the 48-in seam. Close timbering or roof bolting is required in areas overlain by sandstone. At Sonman, shuttle cars are used in rooms.

At Colver mine (Lower Kittanning seam) 6-man crews produce an average of 30 tons per man shift. Bad roof conditions require extensive timbering. Colver is a 100% continuous-mining operation, using both Colmols and Joy ripper-type machines. A total of 15 machines are in operation on a mining system that employs two machines per section.

Performance Standards for Continuous Mining, D. C. Howe, superintendent, Vesta No. 5 mine, Vesta-Shannopin Coal Div., Jones & Laughlin Steel Corp.

In order to establish performance standards it is necessary first to standardize the mining methods, mining projections and equipment to be utilized, and to gain a large measure of control over maintenance.

The calculation of performance standards can be reduced to a fairly mechanical operation once the basic factors have been evaluated. A Joy 3-JCM, operating in the Pittsburgh seam in the area of the Vesta mines, can produce 1.4 tpm of raw material in development work in average cutting conditions and 1.6 tpm in retreat work. These operating rates are qualified by circumstances and location. In setting performance standards it is axiomatic that perfection should be the goal. It is more practical to make an accurate estimate of the factors which prevent full utilization of paid work time and which cannot be eliminated for one reason or another. For example, travel time can be reduced but it cannot be eliminated because there is an economic limit to the number of portals that can be provided. Compliance with safety laws, and the dictates of safety not spelled out therein, also may prevent full utilization of paid work time. The influence of the opinions of inspectors, in matters not defined by law, cannot be disregarded.

Continuous Mining Productivity, R. L. Anderson, supervisory commodity-industry analyst, U. S. Bureau of Mines.

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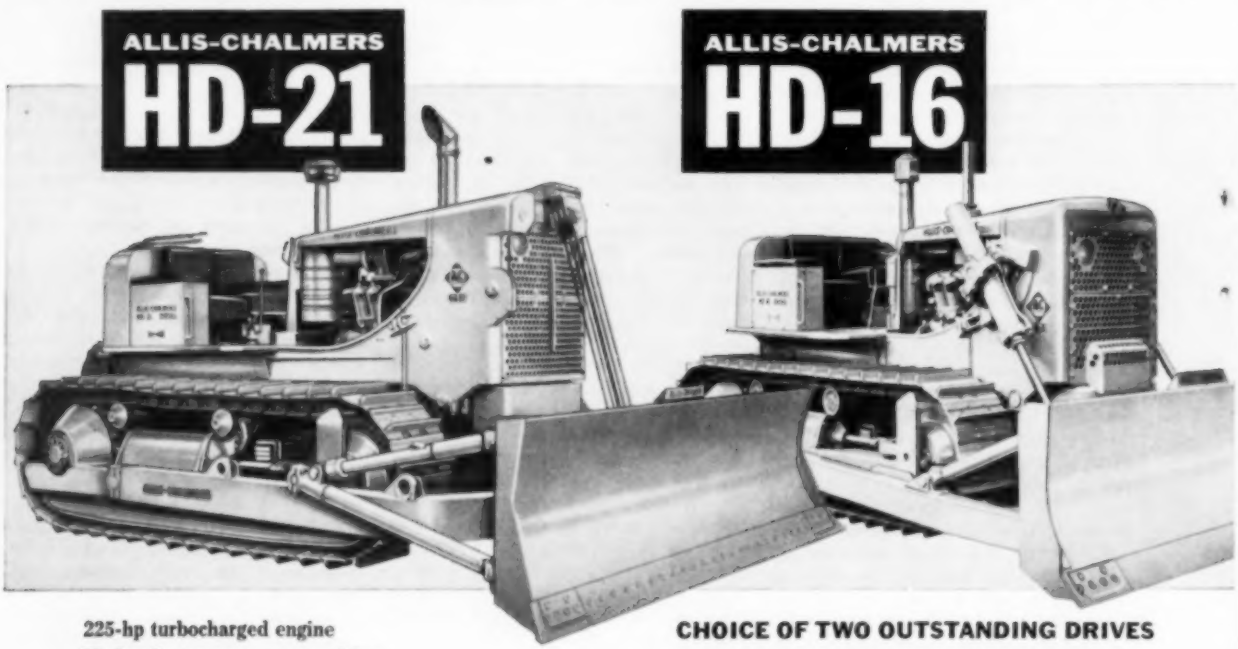

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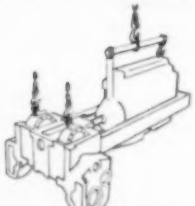

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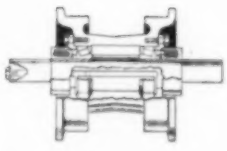

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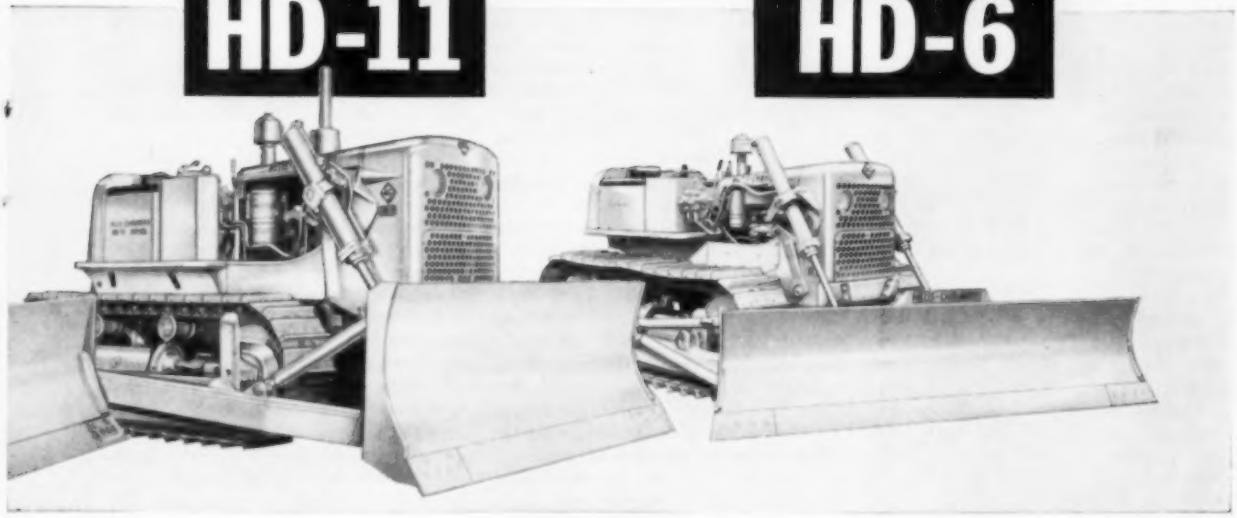
more tough jobs

ALLIS-CHALMERS HD-11



94 belt hp

25,960 lb (approx. as shown)

The HD-11 is setting new standards in its size range . . . offers you dozens of work-boosting advantages, including the industry's easiest shift pattern. A single shift takes it from any forward speed to any reverse—gets short-cycle jobs done faster, easier.

HD-11B illustrated—Two other models available

ALLIS-CHALMERS HD-6

63 belt hp

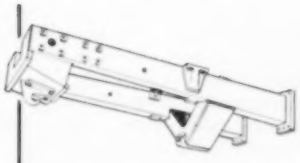
16,470 lb (approx. as shown)

Here's up to 15,500 lb drawbar pull. The HD-6 is the only tractor near its size with big-tractor design advantages—for example, All-Steel Box-A main frame and engine-mounted dozer with direct-lift cylinders for improved weight distribution, accurate dozing and long life.

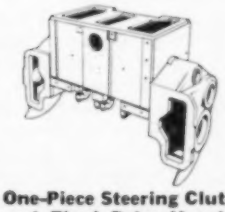
HD-6E illustrated—Three other models available

THAT GIVES YOU ALL THESE ADVANTAGES IN EVERY SIZE

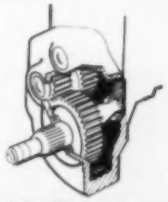
True-Dimension Track heat-treated and machined in the industry's most modern facilities, is setting new track-life records on every type of work.



All-Steel Box-A Main Frame soaks up shock and strain . . . provides improved weight distribution and equipment mounting.



One-Piece Steering Clutch and Final Drive Housing with extreme rigidity and strength . . . line-bored to provide precise alignment of gears and shafts.



Straddle Mounting of All Final Drive Gears with tapered roller bearings on both sides of short, large-diameter shafts . . . provides extra gear life.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

with ALLIS-CHALMERS

It is estimated that 50 million tons of bituminous were produced in 1957 by continuous-mining machine. There were 510 continuous machines in operation at the end of 1956, and in 1957 six manufacturers shipped 168 more. The latest year for which data are available on productivity by method of mining is 1956. Continuous mining was practiced in 14 states and Alaska. A total of 24 mines operated on "continuous mining only" in 1956. Their productivity averaged 14.08 tons per man day, about 3 tons higher than in the next highest method. The group of mines with the second highest productivity rate was "conventional mining—mobile loading into shuttle cars," which averaged 11.17 tons per man day. Average productivity in Illinois for "mobile loading into shuttle cars" was higher than the average of the total for all mines in the group "continuous mining only."

Maintenance of AC Continuous Miners, LaMar T. Lindsay, shop foreman, Sunnyside Mines, Kaiser Steel Corp.

Ripper-type continuous miners at Sunnyside operate on a two-shift basis and average 250 tons per unit shift. Nine units are scheduled for operation while one is undergoing complete overhaul in the outside shop. Natural conditions are severe, including bad roof, steep grades and the incidence of mountain bumps. Major areas of breakdown, derived from 9 yr experience with the machines, involve lubrication shortcomings which have been overcome by strict adherence to schedules and use of specified lubricants. Bearing failure in the cutting head has caused considerable downtime, but this may be reduced by connecting the bearings to the automatic lubrication system of the machine. Life of ripper chains is about 100,000 tons of coal, with rebushed and pinned chains averaging a life of about 75,000 tons. Tramming speed in some units has been increased to 65 fpm, and 6-JCM's, soon to be delivered to Sunnyside, will have tramming speed of close to 100 fpm. The bearing and hold-down ring on the turntable have been reinforced to eliminate a frequent source of trouble. Strict maintenance to preserve the cleanliness of the hydraulic system should be observed, and worn control elements should be replaced as soon as sluggishness in the controls becomes evident to the operator.

Of the first two miners at Sunnyside one was DC-powered and the other AC. The AC machine has required 50% less maintenance. The machines are brought to the outside shop for overhaul on an average of once a year. A complete overhaul requires about 200 manshifts and costs from $17,000 to $25,000. Extra unit assemblies are kept at the outside shop to take care of necessary inside repairs as needed.

Analysis of Service Haulage Behind Continuous-Mining Equipment, Gerald von Stroh, director, Mining Development Committee, Bituminous Coal Research, Inc.

Service haulage systems should be designed to handle tonnages in the magnitude of 4,000 tons per unit shift, which is the projected level of operations in the mine of tomorrow. Now under active development by the Mining Development Committee is a machine having a theoretical capacity of 16,000 tons per shift, which on a 20% operating factor will produce 3,200 tons per shift. Any service haulage system in a system like this must operate on a two-way basis, with handling of supplies perhaps proving to be a bigger job than moving coal. In the offing may be triple-track haulage systems and 60-in belts. Some type of foam for controlling dust may have to be substituted for rock dust at the face. Or a storage silo may be installed on the surface and the rock dust distributed through a pneumatic system.

Gluing of the roof by introducing the adhesive far in advance of mining is a possibility not to be overlooked. Trolley-powered conveyors and large extensible belts would be included under certain conditions.

With regard to the mine of the future, operations may be conducted from 50-ft-diameter tunnels driven 1 mi apart. Then a remotely-controlled machine could be employed to advance from one tunnel to the next, turn around and work back leaving only a narrow rib between openings.

It is calculated that such systems can be installed for an investment of approximately $1 per ton of annual capacity.

Ventilation Problems in Connection with Continuous Mining Machines, D. S. Kingery, chief, Mine Ventilation Section, U. S. Bureau of Mines.

Dissipation of methane in gassy coal mines in which continuous mining machines are used is complicated because the problems normally encountered in a much larger area with conventional mechanized mining are concentrated at a single rapidly advancing coal face. With continuous mining and a steady rate of gas emission, control of ventilating air at the face must be reliable since even a slight interruption in ventilation may permit highly explosive methane to reach a dangerous concentration.

Based upon tests so far completed by the Bureau the mounting of a smaller blower-fan on a continuous mining machine appears promising. In connection with both ventilation and dust control, the most promising design appears to be the blower used in conjunction with an auxiliary exhaust system, with the tube end of system maintained close to the mine working face.

If enough intake air is provided, this system can be made to ventilate most coal-mine faces effectively.

Tests indicate that a small blower within the range of 700 to 1,000 cfm mounted on a mining machine could be a valuable adjunct to face ventilation, but the blower must not be depended upon to do the job alone.

Roof Support With Continuous Mining, G. C. Dyar, general superintendent, Alabama By-Products Corp.

Immediate roof at Maxine mine is black shale varying from 4 to 10 in thick. Over this is gray shale and shale with sandstone streaks, and above these strata is massive sandstone. Vertical slips and planes, hidden by the black shale, occur from 3 to 30 in apart.

In continuous-miner sections crossbars on mine jacks are used on 4-ft centers or closer. In room panels, the first pair of rooms is driven 270 ft with blind crosscuts worked to the left. Succeeding rooms are driven to tap the blind crosscuts, through which roof-support supplies are brought after being brought from the existing rooms. In entry work, the first entry on the right is driven 70 ft and the next is driven twice this distance, again with blind crosscuts to the left. While the miner is in the second entry, the first is bolted on 4-ft centers. This releases the crossbars and jacks for reuse, and it means that the bolting machine is out of the way of the miner and shuttle cars. As the third entry is driven the bolting crew work in the second entry. Then the miner goes back to complete the first entry while bolting is done in the third.

The miner operator is never out from under the supported area and the timbermen are never more than 4 ft from the last collar. Large areas where the blackslate could be loosened by blasting can be worked by continuous miners under temporary support without the expense of roof bolting. Using crossbars and jacks the cost has been less in continuous mining than in conventional mining, in fact, 33c per ton less.

Designing Continuous Mining Systems, Jesse F. Core, vice president—operations—coal, U. S. Steel Corp.

Planning is a phase of any operation, mining or otherwise, which must be given full consideration by all members of management. A real operating plan is not merely a mine projection. Careful inception of the plan entails objective cooperation among mining engineers, industrial engineers, safety experts, accountants and alert operating personnel. The plan must then be presented to

face supervisors in a fully understandable manner because he must execute the plan if desired production and costs are to be attained. It is necessary to know what is to be expected from the plans since without such knowledge performance cannot be evaluated.

No plan is perfect. Accordingly, there must be a constant search for improvement. Diligent execution is important. Experience indicates that in most instances failure to achieve production and cost objectives can be tied directly to deviation from established plans.

Certain factors, which must be given due consideration in formulating any mining plan, become more critical in the rapid advance and retreat techniques of continuous mining. Some suggestions are (1) concentrate face areas whenever possible, (2) prepare carefully worked out mining plans, (3) focus attention of management on improving face procedures, (4) train section foremen in all details of face procedures and (5) train all contract employees on the section to the degree necessary for efficient execution of the operating plan.

Russian Developments in Continuous Mining, C. E. McWhorter, mining engineer, Goodman Mfg. Co.

In March of 1956 the Soviet Ministry of Coal Industry suggested an interchange of technical visits between Great Britain and themselves. Accordingly, with mutual agreement, the British National Coal Board sent a party of 12 technical coal experts headed by Dr. Wm. Reid to the Russian coal fields.

It is evident that the Russians approached the problems of mechanization with a determination to increase national production and tons per man shift. Their coal production is extremely important to their economic growth and is already surprisingly large, as evidenced by these figures:

1955 production under the responsibility of the Ministry of Coal from 10 major coal fields totaled 391 million tons of which 65 million tons were from open pits and 326 million tons were from underground.

An additional 14½ million tons were produced under license by local councils, bringing the total 1955 production to 405½ million tons.

The coal beds now being worked are all fairly shallow, the deepest being 1,200 ft. The seams are generally level and free of faults, but a few pitching seams up to 35 deg are mined. The seams are fairly gassy.

While the Russians have made great progress in developing machines for coal, they are practically all for longwall application. They apparently believe that longwall systems are to be favored over room and pillar although their depth of cover over most seams is not reported as being much more than ours. Longwall systems require a great deal of temporary roof support along the faces, and as far as we know this work has always required excessive labor, accounting for high cost. However, the Russians are expending a great deal of time, money and energy in an attempt to mechanize this roof control of long faces. The British report shows that many ideas are being experimented with and some show inventive promise. It will be well for us to watch this phase of their development, as they might come up with ideas for roof support that would control long face work with very little labor. If they do, longwall mining could conceivably show an improved cost over our best room and pillar results.

Final feature of the second session on continuous mining was a formal discussion of Russia's hydraulic mining methods by T. Reed Scollon, chief, Div. of Bituminous Coal, U. S. Bureau of Mines. A description of the method appears in *Coal Age*, May, 1957, p 210.

Conventional Mining

High Production in Thin-Seam Mining, J. L. McQuade, president, Tioga Coal Corp.

Small crews are achieving high production in 38 to 42-in coal using rubber-tired top-cutting machines, a new mine projection and bridge conveyors at the Tioga Coal Corp. The operation is set up in a piggyback section and is based completely on 440 V-AC power.

The piggyback section has done these things for our company: It has increased tons-per-man over what was possible by hand-loading on conveyors; it has permitted better control of top, and safer working conditions; it has permitted concentrated mining; it has brought better and less supervision.

Foreman Training, John E. Kaites, industrial engineer, Berwind-White Coal Mining Co.

To develop the full potentials of new and improved equipment, special education in industrial engineering has been found essential to supplement routine state-certification training of foremen and other supervisory personnel. The educational program was designed to:

1. "Sell" industrial engineering to a greater degree.

2. Train section foremen to be able to help prepare standard methods and work procedures based on time studies made by industrial engineers.

3. Foster foreman cognizance of their responsibility for equipment and preventive maintenance.

4. Instill in supervisory personnel a desire for better communications, cooperation and motivation.

Every official at the mine, including mine foreman and superintendent, is taken through the program. Training is adjusted to meet individual needs and it covers a minimum of 2 to 5 wk periods with the Industrial Engineering Department.

Problem-solving sessions, accompanied by follow-ups, are considered an especially worthwhile part of the overall program.

Maintenance Program of Elk River Coal & Lumber Company, John L. Henley, master mechanic and chief electrician, Elk River Coal & Lumber Co.

Preventive maintenance at Elk River Coal & Lumber Co. centers around maintenance of electric substations; care and rebuilding of haulage locomotives, stationary motors and mining machines; and a training program for maintenance men.

Each of the company's eleven 300-kw motor-generator substation sets receives a careful inspection weekly and thorough cleaning and replacement of worn parts has reduced the loss of time from power failures to a minimum.

Haulage motors, 10- and 13-ton motors in tandem, are assembled in the company's shop, and each main-line locomotive is scheduled for a shop check after every 24 hr of operation.

Each piece of mining equipment is on schedule for complete overhauling and rebuilding in the company's main shop, where facilities permit one motor, one cutting machine, and one loading machine to be overhauled at the same time.

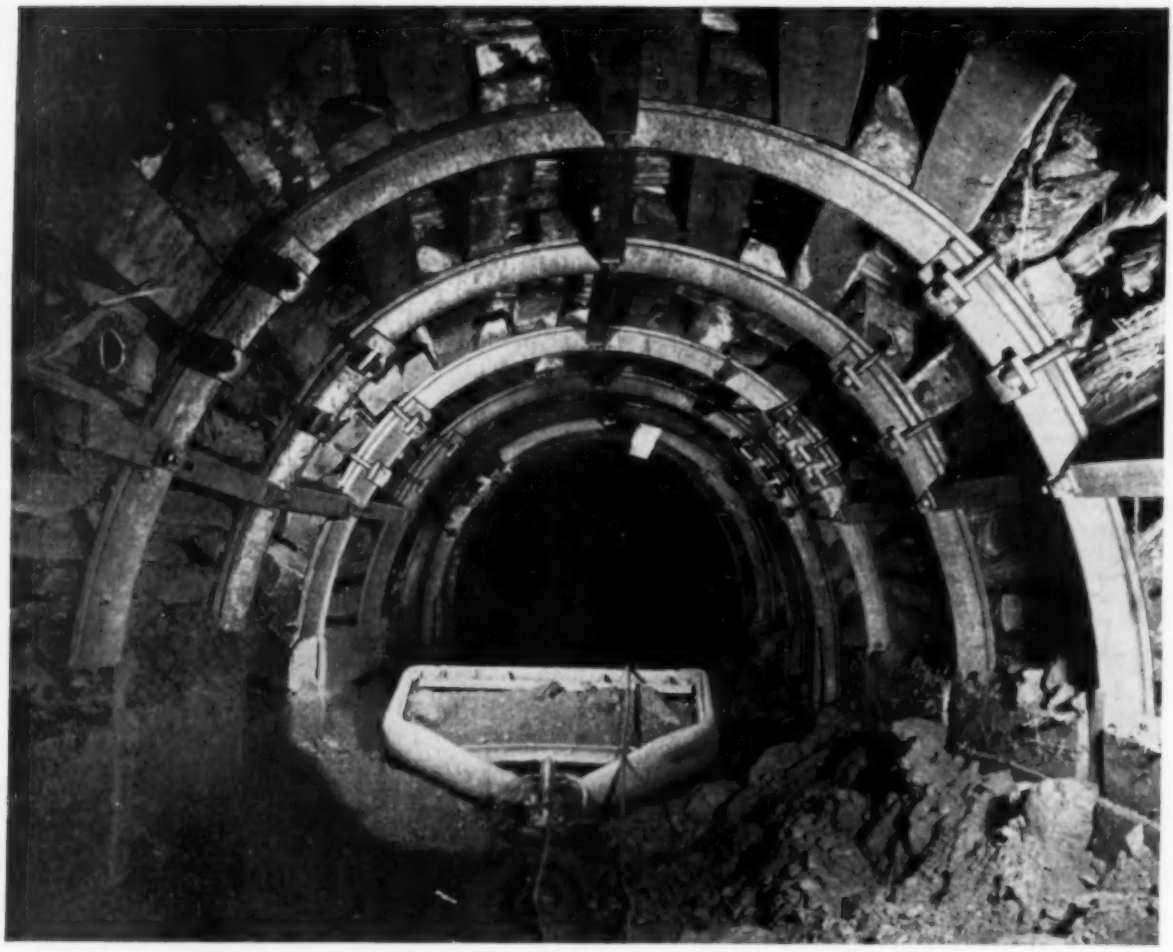
These four lines of action have been found very effective in preventing breakdowns: (1) conduct frequent, complete, thorough inspections at regular intervals; (2) lubricate properly; (3) make repairs before machine failures permanently damage the equipment; and (4) have machines operated only by skilled operators and maintained only by thoroughly trained mechanics and electricians.

Modern Approach to Equipment Maintenance, Ralph B. Dean, Lorado Coal Mining Co.

An effective mine equipment maintenance program must stress rigid inspection, preventive maintenance and scheduled overhaul.

Routine checks of equipment are not sufficient. The making of such checks should be done by an individual whose responsibilities include the minimizing of delays and the selection or scheduling of equipment for overhaul.

The primary objective of preventive maintenance is to detect small defects or malfunctions of machinery and to see that they are corrected before they develop into major breakdowns. Periodic overhauls should be based on inspection



Yieldable Arches GIVE when the "squeeze" is on

Heavy or shifting ground around a mine opening always needs some form of support, to give the overburden a chance to settle naturally into a pressure arch. Mining men have found that the best type of support is one which will yield slowly to the pressures until the natural arch is formed; rigid sets simply cannot stand up under the squeeze of the dynamic forces.

HOLDS FAST UNDER NORMAL LOADS

Bethlehem's Yieldable Arch works on a principle of sliding joints, which are formed by the lapping of one U-shaped segmental steel section over another as shown in the illustration. Husky U-bolt clamps are installed in pairs over the lapped joints, and drawn up tightly enough to hold fast under normal loads. As pressures bear down, however, the arch yields, a little at a time.

PRESERVES MINE SAFETY

The more the Yieldable Arch "gives," the more the stress is transferred to the surrounding material. Eventually, equilibrium is reached and the Yieldable Arch stands pat, its structural integrity maintained and mine safety preserved. That is why you will hear it said that the yielding feature of the Arch is more important than its physical strength.

The Yieldable Arch can only be highlighted here, of course; there is much more you will want to know. Its ease of installation, for example, and its high degree of recoverability. You'll be interested too, in knowing, that many Yieldable Arch installations have paid for themselves in months! A Bethlehem engineer will gladly discuss the full story in terms of your own special problems. Just write to the address below.

BETHLEHEM STEEL COMPANY
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On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

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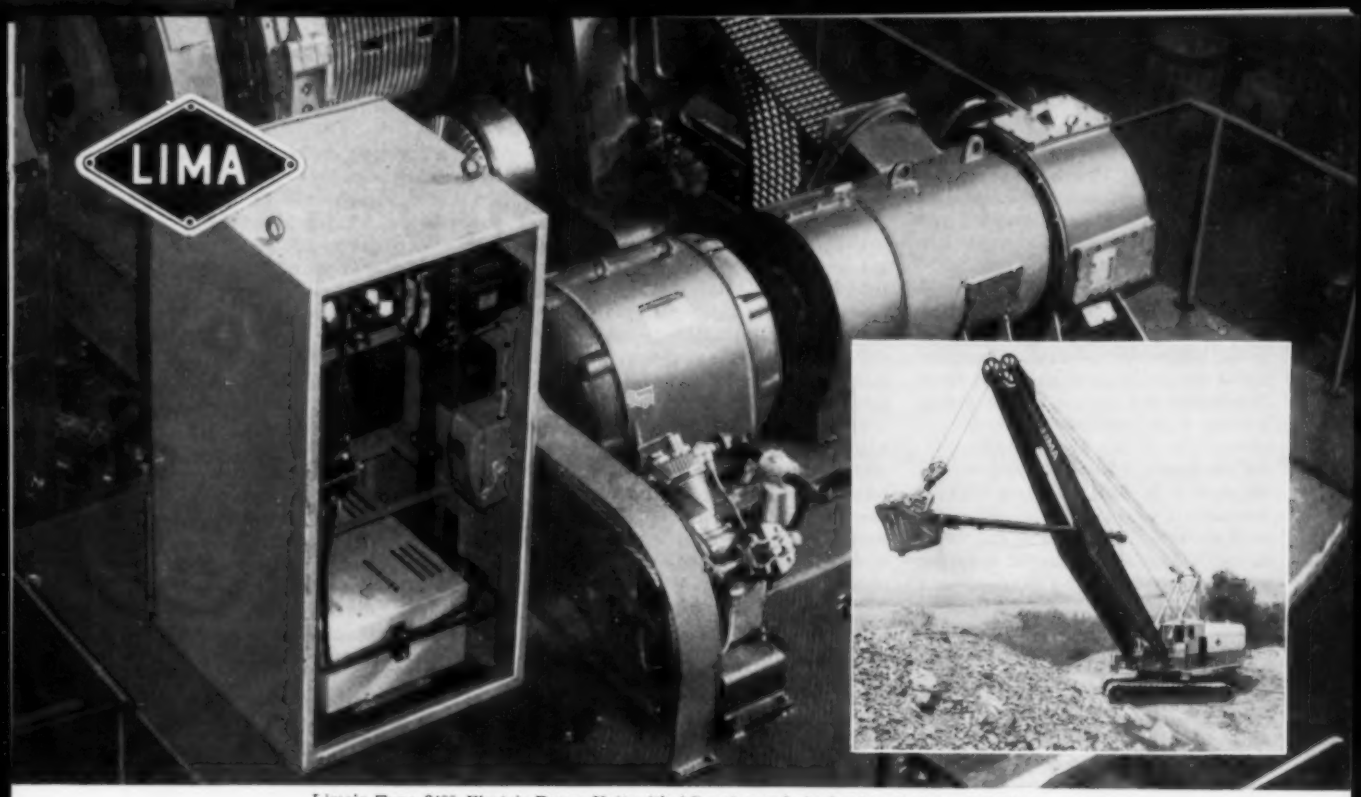


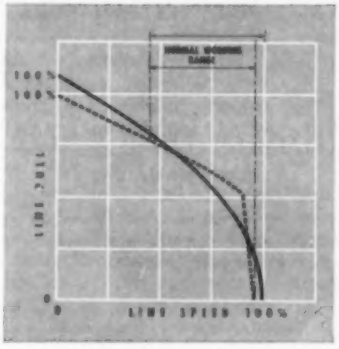
Lima's Type 2400 Electric Power Unit with AC motor and single-stage torque converter.

LIMA'S Electrical Power Unit prevents stalling, won't burn out

With Lima's optional power unit, you get power on demand through a wide operating range, and the motor will not stall or burn out under heavy load conditions. Combining an AC motor with a single-stage torque converter, it adapts actual power output to work load demand—at constant motor speed. Thus, electrically it matches diesel-torque converter performance.

Just check the performance curves—They make it clear that LIMA's new electric power unit is the perfect answer when your job calls for electrically powered machines. Available on every Lima machine—shovels to 6 cu. yds., cranes to 110 tons.

Get the full story today from your nearby Lima distributor. Or write to Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.



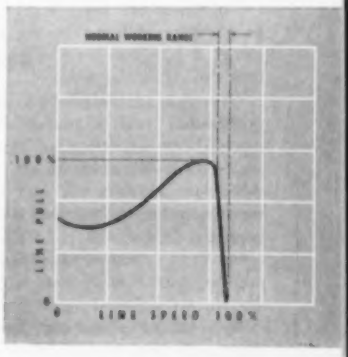
Power Performance of LIMA'S Optional Electrical Power Unit.

Power performance curve of Lima's electrical power unit (solid line) compared with that of a diesel-torque converter unit (dotted line). As can be seen, the line pull will constantly increase through a long pull down in speed range, depending upon the load applied. Even under extreme loading the motor will pull down in speed only slightly and can never be stalled.

Power Performance: AC Electric motor with direct drive—

The motor speed and torque varies as shown for line speed and pull.

With a pull down in speed of only 3% to 5%, torque rises too fast. The motor will stall quickly after peak torque is reached. Workable speed range is small, stalls are frequent.



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LIMA Construction Equipment Division, Lima, Ohio

BALDWIN · LIMA · HAMILTON

Shovels • Cranes • Draglines • Pullshovels • Roadpackers • Crushing, Screening and Washing Equipment

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BALDWIN BLH LIMA-HAMILTON

rather than on hours of work or tons of coal handled. This is necessary because, in most mines, equipment operates under varying conditions.

Safety

Mine Lighting, Robert R. Godard, electrical engineer, U. S. Steel Corp.

The latest experiments in mine lighting at Robena Mine suggest that better illumination can be a powerful tool in gaining higher productivity and more efficient use of men and materials.

The experiments were based on the installation of 200 fluorescent lighting fixtures in a complete continuous mining section where the production and safety record was good. Choice of a section was dictated largely by nearness to a source of AC power so that neither high voltage transmission nor generator sets would be needed.

The introduction of a full-scale lighting system was met with mixed emotions by men in the section: Some liked it, some objected and others were noncommittal. But initial experience has been favorable. Benefits accruing to the maintenance force and a tendency toward better housekeeping are self-evident.

Before an accurate evaluation of benefits and costs can be made, further testing under poorer conditions is necessary.

Experience with Flame-Resistant Belting, D. B. Shupe, mine superintendent, Eastern Gas & Fuel Associates.

It is steadily becoming more evident that polyvinyl-chloride belting will stand the abuse and be far safer and more economical than conventional belts. Our experience is based on use of P. V. C. belting, for 2½ yr under every type of service, carrying both clean coal and heavy draw slate.

No statement can be made on the propagation of flame by the belting because it has not been exposed to any fires during actual service.

Operation of the plastic belting under permissible ventilating conditions has passed the inspection of both federal and state inspectors with no criticism to date. Also notable, the cost for permanent stoppings along the belt line has been cut in half.

P. V. C. belting has become very popular with the off-shift moving crew, due to its lighter weight and its pliability, both of which contribute to handling ease and to respooling or retreat moves. Also, the crew has never had to install new splices before a section of belting could be installed in an extension move.

Safety Advantages in the Use of A-C Power Underground, Ralph M. Hunter, manager, Electrical & Mechanical Dept., Rochester & Pittsburgh Coal Co.

The use of alternating current offers improved safety in several ways:

1. Hazards of mine fires and dust and gas ignition by electric are very greatly reduced. Safer trailing cables, providing more reliable and more sensitive protection against faulty cables, greatly reduce the possibility of an open arc which can ignite coal dust or other flammable material.

2. The hazard of gas ignition by face equipment is reduced by eliminating moving contact parts on motors and resistors and by reducing controller sizes. Also, low-ground voltage and rapid accurate clearing of ground faults reduce the possibility of sparks between machines.

3. Shock hazard to personnel is greatly reduced. There are no exposed conductors and any fault that might place potential on equipment is removed rapidly and its intensity is controlled at a low value. Hazards, due to arcing faults, are also greatly reduced, if not entirely eliminated.

4. Availability of low voltage for lighting opens the way for economical and efficient lighting of the face area, with a corresponding improvement of working and safety conditions in that area.

These results can be obtained only if the AC system is properly engineered, properly installed, and properly maintained. Introduction of AC power to the face area is not a reason to neglect proper maintenance. The possibilities available will only be achieved if proper procedures are followed in keeping the equipment in condition to operate as designed.

Rock Dusting in Multiple-Shift Operations, C. E. Linkous, director of safety, Island Creek Coal Co.

The first objective of rock dusting mines in multiple-shift operations is to render the coal dust inert so that it will not explode in the event it is accidently thrown into the presence of an igniting agent. By reducing or entirely eliminating the possibility of an explosion, the lives of many valued employees can be saved. Gaining these objectives requires the following:

1. Top management must desire safe operations.

2. Equipment, crews and a supply of rock dust at convenient locations must be provided.

3. There must be a plan for application of the rockdust.

4. Each supervisor and mine worker, who is to perform the work, must be familiar with the plan and strictly adhere to same.

5. A continuous check must be made by company safety personnel to assure that rock dusting is being carried on according to plan.

6. Local management must take a personal interest in this phase of modern coal mining and accept it as part of their responsibility in safe mine operation.

Haulage

Recent Developments in Shuttle Cars, A. L. Lee, director, Lee Engineering Div., Consolidation Coal Co.

We believe that the AC-shuttle car will prove to be superior in every way to those having DC-drive motors. The cable problem does not so far appear worse than with DC-power. Protectively grounded AC power systems are used and all cars thus far built have been for 440 V, three phase. A three-conductor No. 6 cable is ample in electrical capacity for the 30-hp motor now used on the cars.

At this time we cannot estimate how far the use of diesel engine driven underground shuttle cars will be extended but the efficient use of horsepower will in any event be imperative. Ventilation requirements and safety as well as psychological considerations will dictate the limits to which the burning of unnecessary fuel will be tolerated in any kind of underground mining.

The single-motor car, designed by the Lee Engineering Div., Pittsburgh Consolidation Coal Co., has an efficient power transmission system with ability to operate under widely variable loads and grades. In this system the engine—AC or DC motor, whichever is used—operates only in the speed range where horsepower is produced efficiently and internal- and external-heat exchange is materially effective. In addition, possible savings in electrical power or fuel should not be ignored.

Quite recently, a new low-type shuttle car has been developed by the Joy Mfg. Co. It represents a departure from conventional design in that it is equipped with six wheels and is articulated in the vertical plane to minimize roofing of the ends of the car as would be likely with a rigid vehicle of equal width and length. Each of the two center wheels is driven by a 10-hp traction motor. The conveyor is driven by a 7½-hp motor and the hydraulic pump is driven by a 7½-hp motor. Tires are of the semi-solid type, requiring no inflation. Tractive effort approaches that of a two-wheel drive car. The wheels at each end are steered but not powered. The electrical and hydraulic system are not greatly different from that of other multi-motored DC cars now in use in coal mines.

High-capacity-low-type cars of the single motor type will be made available in the near future.

Combination Belt and Mine Car Haulage, C. W. Padgett, general superintendent, Bell & Zoller Coal Co.

The arguments pro and con belt haulage, or track haulage, or a combination of both, can only be answered after an intensive study of the characteristics of the particular property in question.

At Buckhorn, the utilization of both track and belt haulage has proved itself applicable to handling of coal and materials as well as the transportation of men to and from their working faces.

The maintenance of low costs in the handling of coal, and the transportation of men and equipment within the mine as quickly as possible, is of utmost importance to the coal industry. Solving these problems varies from mine to mine and no one system may provide the answer. In combinations, however, efficient underground transportation may be achieved.

Mack H. Shumate, assistant general manager, Truax-Traer Coal Co.

Combination belt and mine car haulage facilitates the extension of haulage during rapid development and extraction behind high-capacity equipment. Belts also permit the mining of a considerable area, the tonnage of which is dumped at a single point. Fewer loading points and side tracks and a more uniform loading of mine cars give the coal operator the fullest efficiency of his equipment.

At one of our West Virginia mines, the use of conveyor belts with mine cars has resulted in a large reduction of mine haulage costs. In 1952, haulage costs were 31c per ton for labor and supplies. Since the installation of conveyor belts, there has been a steady decrease to 20c per ton early in 1958. This is a savings of one third in haulage in spite of five wage increases amounting to $5.90 per 8-hr day, an additional $80 for vacation pay, and an additional 10c per ton for the mine workers welfare fund.

E. M. Pace, general superintendent, and **E. H. Roberts,** chief mining engineer, Inland Steel Co.

Analysis of underground haulage operations at Wheelwright and Price No. 1 mines indicated the need for replacing existing mine cars with new, larger models. An 8-wheel, 24-in high, 262-cu ft capacity car with automatic couplers was selected after considering many factors including the life of the mines, the amount of old workings, distances, tonnages, speed and size of trips, weighing and dumping facilities, power requirements, basic mining plans, size and design of cars, capital investment required and anticipated realizations from making the change. The major items of cost which received close scrutiny were the new car investments, head-house conversion, automatic couplers for locomotives, installing new larger radius turnouts and making additional clearances.

After 4 yr of experience with the new cars, we have realized a 33% reduction in haulage costs and a 5% reduction in overall mining costs. At current savings, the company investment will be returned in from 2½ to 3 yr.

An Operations Research Approach to Mine Haulage, Ernest Koenigsberg, head, Operations Research Section, Midwest Research Institute.

The pressing problems faced by mine operators and the importance of haulage to efficient operations will, it is hoped, encourage operations research studies or the use of scientific and mathematical methods to solve business problems.

Practically all the operations research work in the mining industry has combined the techniques of industrial engineering, work study and cost analysis. Relatively little effort has gone into the study of systems in themselves and to the formulation of mathematical and statistical models of operation.

The model provides a tool for measuring the effectiveness of the system and for studying the effects of changes on efficiency, output, cost, etc. Contemplated changes in mining methods and stronger output limits imposed by haulage systems in many mines render the model approach worthy of consideration.

The feasibility of applying operations research techniques has been demonstrated in a study of conventional face operations in the U. S. A. (*American Mining Congress Journal*, p 64, March, 1958). Studies of rail haulage in British Coal Mines have also been made by the National Coal Board.

Oscar D. McDaniel Jr., manager, industrial engineering, Old Ben Coal Co.

In my opinion, operations research techniques are applicable to haulage problems, mainly because cyclic-type operations are manifest in our mining systems. Each operation cycle is interrelated to performance of other operations. This complex nature requires the use of some evaluation of formerly ignored variables and certainly a better appreciation of most variables than the use of averages or mean values. However, we must keep in mind that operations research is not problem-seeking, but problem-solving. Finally, if management, from top to the lowest level, can accept this approach with greater confidence and responsibility, we can only profit by its use.

Coming next month . . .

The regular July issue of *Coal Age* will feature an 8-page article by Associate Editor A. E. Flowers on the recent modernization of Oakmont mine of the Harmar Coal Co., Oakmont, Pa. Other articles which will provide answers to some of your special problems include descriptions of raw-coal storage facilities at an Indiana strip mine, simplified heavy-media systems in anthracite plants, an improved tractor-mounted overburden drill in Alabama, continuous mining in bad conditions, and the Pennsylvania regulations on the design of gas-well pillars.

. . . And the 1958 *Coal Age* Mining Guidebook

Mid-July is publication date for the latest edition of the up-to-date, down-to-earth 1958 *Coal Age* Mining Guidebook and Buying Directory. This is an issue you will want to keep and use all year as a reference on mining practices and a guide to who offers what in goods and services for coal mining.

The Guidebook section covers all phases of operations in deep and strip mining and in preparation. Also included in the Guidebook is a running bibliography of case histories to help you search out facts in areas you must explore.

The Buying Directory includes listings of products you need to do a better job with the names of manufacturers who offer such products. You will find the Mid-July issue a handy one to have.

In the works . . .

The *Coal Age* editorial program for early coming issues includes a report-in-depth on the UMWA hospital and medical program, by W. A. Raleigh Jr., and a case study of a modern power-distribution system, by Daniel Jackson Jr.

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Heavy Duty Mining Buckets

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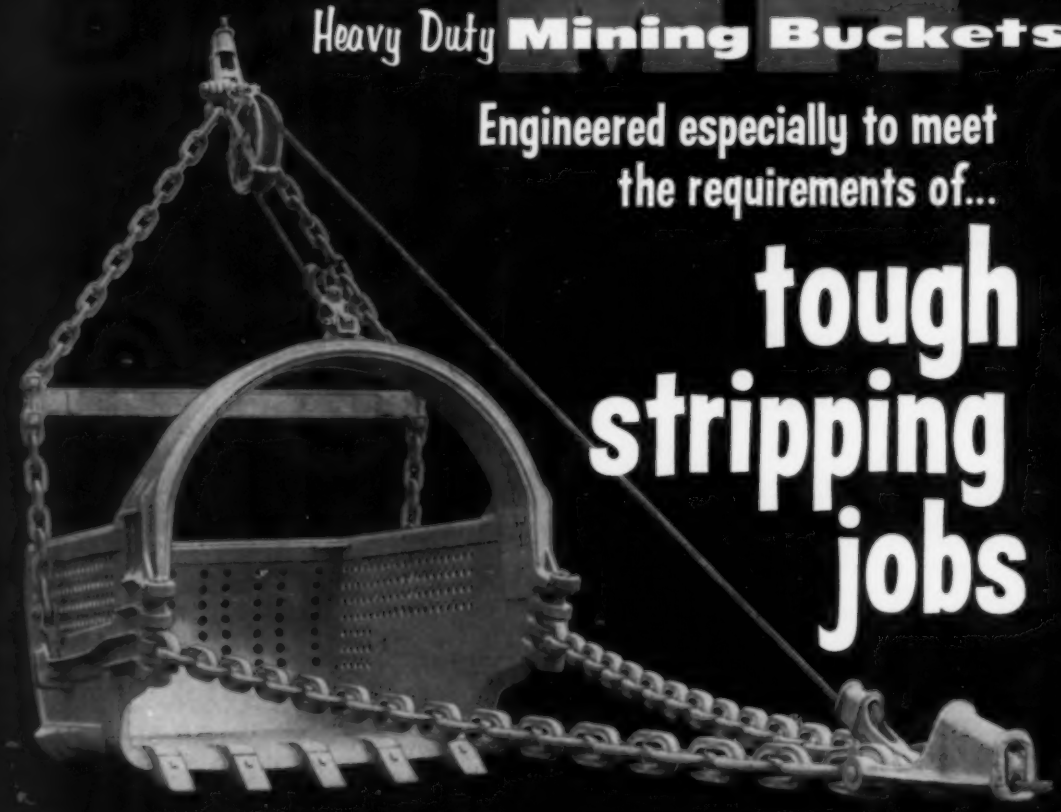

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Behind these cable constructions are service records that prove the extra long life of Okocord portable cables in the face of continual high-speed reeling, rock falls, run-overs and constant dragging over mine floors and around sharp corners.

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3. By intimate, first-hand knowledge of mining problems and conditions.
4. By self-imposed standards for manufacturing and testing that are more exacting than the industry requires.

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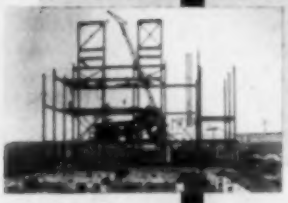

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Foremen's Forum

YOUR LOADING-MACHINE OPERATOR leads the production cycle. Help him to become an expert at his job and your efforts will be repaid in increased safety, lower costs and higher efficiency. He can set an example for operators of other units.

Supervising Loader Operators

The supervisor's responsibilities:

1 Know the duties of loading machine operator

2 Know what can and can't be done with a loader

3 Insist upon good maintenance and proper methods

THE LOADING-MACHINE OPERATOR on your crew directly influences safety, efficiency and costs. All equipment operators share this importance in some degree, but the loading-machine operator usually paces the crew. There are certain things he should do, for his machine and with it, if maximum safety and efficiency and lower costs are to be achieved. Supervisors should know what these procedures are in order to properly advise veteran operators or train newer ones. Following is an abstract of an article on the duties and responsibilities of a loading-machine operator, which appears in the March, 1958, issue of *The Safe Mine Foreman*, a publication of the accident-prevention division of the Coal Dept., Eastern Gas & Fuel Associates.

An unskilled operator may not be able to produce coal or he may be able to produce for a while at the expense of safety and maintenance. The skillful operator is a man who is willing and able to perform all parts of his job in the right manner. He must know the proper ways.

Beginning of Shift

He should examine the loading machine at the beginning of the shift to determine, as far as possible, if all mechanical and electrical parts are in proper operating condition. The machine may not be in factory condition, and he should remember to consider and compensate for small defects until repairs can be made. If the defects constitute a hazard to himself or others, repairs should be made then and there before production is started.

The machine should be properly oiled at the beginning of a shift. Excessive oiling is not only a waste of lubricant but it also creates a fire hazard. Oil spillage on the machine quickly collects dust which sometimes prevents ventilation of the working parts. This can become a fire hazard or it can create disagreeable working conditions. A good operator will avoid spillage, wipe off excess oil if it is spilled and in his spare moments will rake off accumulations of oil and dust. He reports oil leaks as readily as he does mechanical or electrical failures.

Tests for gas and of the condition of the roof should be made before the machine is taken into the immediate face area. The test for gas should be made as near the face as permanent and safety timbers will permit. The roof must be examined, and one or more safety timbers should be set, if necessary.

Then the loading head should be lowered and cleanup started as the machine advances toward the loose coal at the face. Cleaning up on the advance makes

3 sure ways to cut mining costs with USS "T-1" Steel

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Shuttle car bottom plates give months of extra life. USS "T-1" Steel is often specified for the bottom plates of the National Mine TorKar shuttle cars because of its resistance to impact abrasion. The coal mining or loading machine empties into this car, which progressively conveys its load to the rear until the car is full. Then it trams to the main haulage point and discharges its load.

Truck liner cost cut 75%. Truck liners in mining service take a terrific scouring from the combination of impact and abrasion. They wear out fast. But the owner of these trucks heard about USS "T-1" Steel and put 1" plates on the bottoms and ½" plates on the sides. Now he's getting twice the life at half the cost of previous liners. This figures out to be a saving of 75%.

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No other constructional alloy steel available today combines such great strength with toughness, resistance to impact abrasion and ready weldability. It is a proven steel. Use it for dippers, sticks, booms, chutes, hoppers, cars, trucks—and your maintenance costs will tumble to rock bottom. Write for our booklet, "Mining's Metal," United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. *USS and "T-1" are registered trademarks.*

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better shuttle-car runways, prevents loose coal from being ground into dust and removes the stumbling hazard for the operator. Stumbling has caused many operators to have their feet under the crawlers or helpers to fall into moving parts of the machine.

Roof Support

Ordinarily, the cut is broken on the right side. The operator should load as far as he can reach without passing beyond the protection of the line timbers on the right side. When the back of the cut cannot be reached under this protection the machine should be stopped and the line timbers advanced. The controls of the machine should not pass the last timber. Safety posts should be set in the extracted area before the next run is made in the center of the place. Under no circumstances should the operator or helper pass inby the last roof support.

The danger of rib rolls and falling brows is prevalent, more particularly in high, narrow places. Such loose material should be taken down.

Dust Control

Loading is perhaps second to cutting as a cause of putting dust into suspension. Some machines are equipped with spray heads to which the hose is attached. Be sure that foreign material is flushed out of the hose before the attachment is made. The hose or pipeline may be suspended from roof bolts or spads by pieces of wire. Be sure the ends of the wire are turned up to prevent facial or eye injuries to men passing underneath.

The loading machine operator has a responsibility to prevent as much airborne dust as possible, not only for the health and comfort of himself and the others in the section, but also to prevent dust-explosion situations. Foremen must realize that the more dust in suspension, the greater the fire or explosion hazard.

Excessive dust requires cleaning up by hand labor or excessive use of rock dust for dilution. By the time rock dust is distributed in the working area it costs at least $15 per ton, and a ton of coal doesn't sell for that much.

Hazards from Motion

Flying objects thrown by the digging arms or fouled under the conveyor chain are another hazard. The best prevention for this is to stop the machine and remove any foreign objects from the shot coal.

The operator and helper should have an understanding whereby the operator knows when the helper is going to pass the discharge boom. Otherwise, he might be struck by the swinging boom. The operator should take time to look back before swinging the boom or angling the machine across the place.

Every loading machine should have locks for the digging arms. The arms should be locked when the machine is trammed from place to place or when the operator, helper or mechanic have work to do at the front of the machine. The lock should be kept in good repair.

Operators are sometimes squeezed between the machine and timbers while tramming. This type of accident usually occurs as the machine is taken around a corner at an intersection. All too often, rather than back up to get a straight run through the intersection, the operator will permit the machine to tram while he reaches around a post to catch the controls on the other side. The machine knocks out the post and pins the operator. There is no excuse for this.

Another common accident is mashing of the operator's foot under the crawlers. The only prevention is for the operator to watch what he is doing. This is something like an auto driver looking aside and running off the highway. Only the operator is responsible and able to prevent this type of accident.

Tramming through check curtains is more dangerous to other members of the crew. Sometimes there is so much noise in the section that the loading machine cannot be heard by someone on the other side of a curtain. The helper should precede the machine or the operator should stop the machine, if the helper is handling cable, and look through the curtain before proceeding.

Using Machine Guards

The simplest of all guards is the hinged split guard that can be flipped down over the control levers to lock them in place. This guard should be used because the controls can be opened by dragging a cable across them or by falling material.

The guards over the sprocket chains which connect the tramming motors to the crawlers are never in contact with moving parts and never wear out, when properly installed. If they are loosely bolted they drag against the chain, damaging the guard and the chain. They become so worn that they are no longer of value, and the noise of the chain rubbing against them becomes so annoying that they are removed and gobbed. These guards should be properly maintained.

The operator should give close attention to the flexible sheath that covers the first few feet of trailing cable at the machine. Damage to the cable insulation here will expose the operator and the helper to burns or possible electrocution. Wherever possible, the cable should be suspended out of the way of the movement of other units. This is a contribution to safety as well as efficiency. Cable maintenance is an operator's responsibility, but it should get close supervision, too.

Fire extinguishers may be considered as machine guards. They should be fully charged and in good operating condition.

Repairs and Maintenance

A loading machine will not operate at full efficiency and maximum safety unless it is maintained in a condition as near perfect as possible. Any inadequacy in the machine either detracts that much from the efficiency or safety or it must be compensated for by additional watchfulness and labor on the part of the operator. Proper maintenance benefits the company and the operator.

All defects should be promptly reported and repeatedly until corrective action is taken. However, it is obvious that the less abuse a machine receives, the less reporting and repairing will have to be done.

Foremen should realize that machinery defects adversely affect production and may also damage the reputation of a safe supervisor.

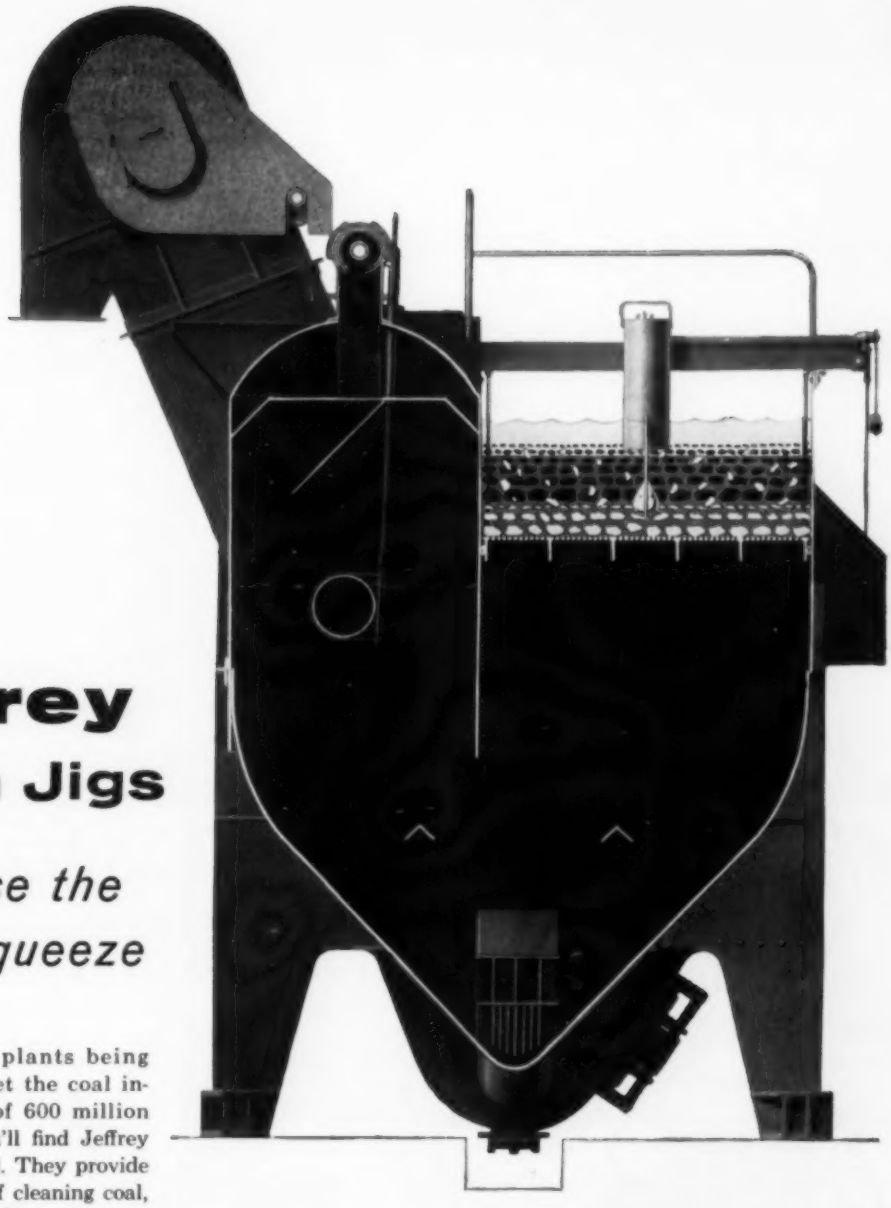
In making repairs, no work should be done on or under the discharge boom until it is securely blocked to prevent it from falling. And electrical repairs should not be attempted until the power is off and steps have been taken to prevent anyone from unknowingly applying the power.

End of Shift

At the end of the shift the machine should be trammed back to a safe location under good roof. It may be assumed that the next shift will take over shortly, but one never knows. Many unexpected difficulties may arise which might prevent operation of the section the next shift or the next 10 shifts.

Upon leaving the section the loading machine operator should disconnect the power from his machine at the nip or junction box. He will then be certain that his machine will not develop electrical trouble that will lead to a fire.

This enumerates most of the duties and responsibilities of the loading-machine operator. He is a skilled workman who can produce coal in quantity. He expects and should have the kind of supervision that creates conditions in which he can do his best. Having created these conditions for the loader operator, you can create a similar working atmosphere for other operators. Your reward will be higher efficiency.



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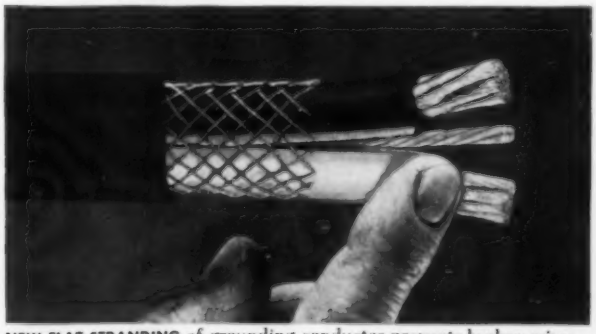

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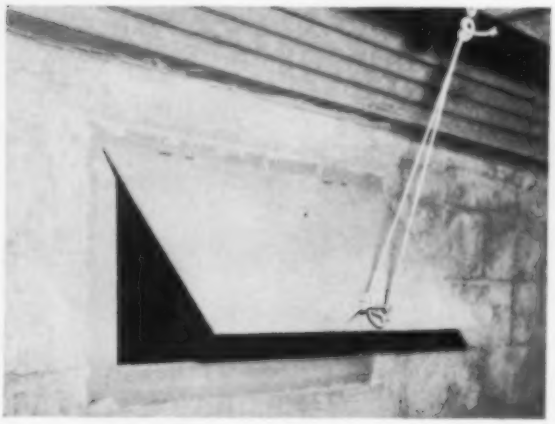
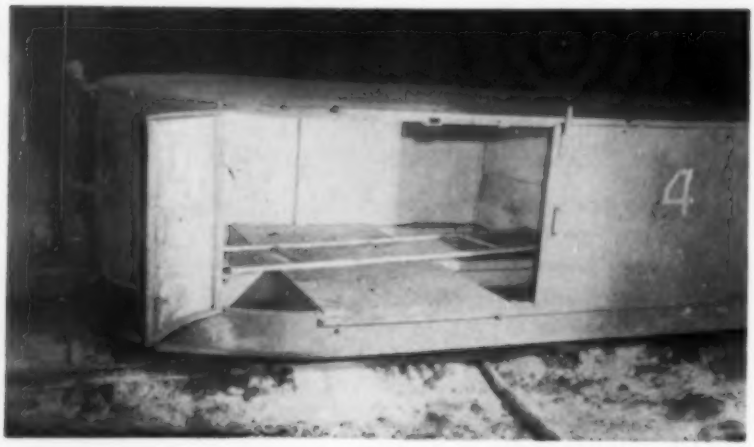


Fuse Link Controls Substation Fire Doors

AUTOMATIC closing of two steel doors on underground substations in event of a fire is assured with a fuse-link connection between ropes holding the doors open. The main door has two sections, each of which is suspended by two wheels riding on an inclined track. Each section of the doors is held open by a piece of rope that connects to a common section of rope near the roof of the substation. This common rope terminates at one end of a fuse link over the substation at Harmar Coal.

The smaller regulator door at the back of the building also is connected to the fuse with a section of rope. As long as the fuse link remains intact the two doors are held open. If there should be a fire in the station, the link would melt and the doors then would close by gravity, confining the fire to the interior.



Mantrip Car Is Also Ambulance

MANTRIP CARS perform two jobs at Harmar Coal's Oakmont mine. One section of the car is completely enclosed and is ready to serve as an ambulance in event of an accident. This part is sealed off from the regular seats and is painted white on the interior. Two steel doors permit a stretcher patient to be placed in the compartment easily.

The company was able to convert part of the mantrip cars to the ambulance section when the mine was modernized with continuous miners and fewer men were transported to each working section.

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A blend of styrene-base resins and synthetic rubber to give good impact resistance and high, effective tensile strength...

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An economical price to solve corrosion and high installation cost problems that would ordinarily chew into your profits...

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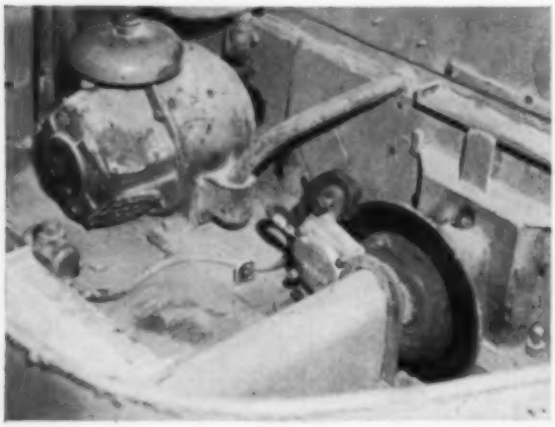
Operating Ideas (Continued)



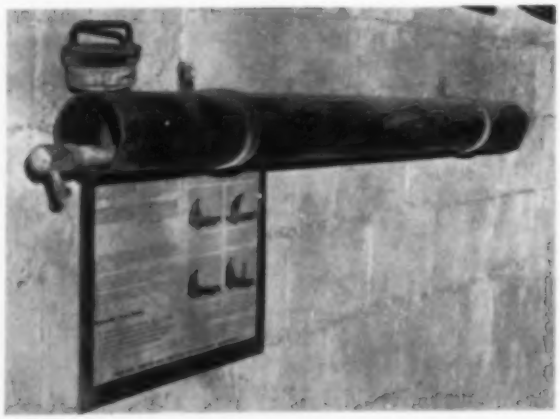
Hydraulic Disk Brake for Personnel Carrier

IMPROVED BRAKING on personnel transportation units at Oakmont mine, Harmar Coal Co., Oakmont, Pa. is achieved with disk-type hydraulic brakes built from materials used on various mining equipment. The brake is operated by pulling a hand lever which can be locked in the "on" position with a wedged-shaped device. Once the wedge is put in position, it keeps the lever from moving. And as the brake shoe wears down, the wedge automatically takes up the slack.

Components of the brake include a brake block from a Joy 1CM continuous miner, brake disk from a Joy shuttle car, hydraulic cylinder from either a Fletcher roof bolter or a shuttle car and the operating lever.

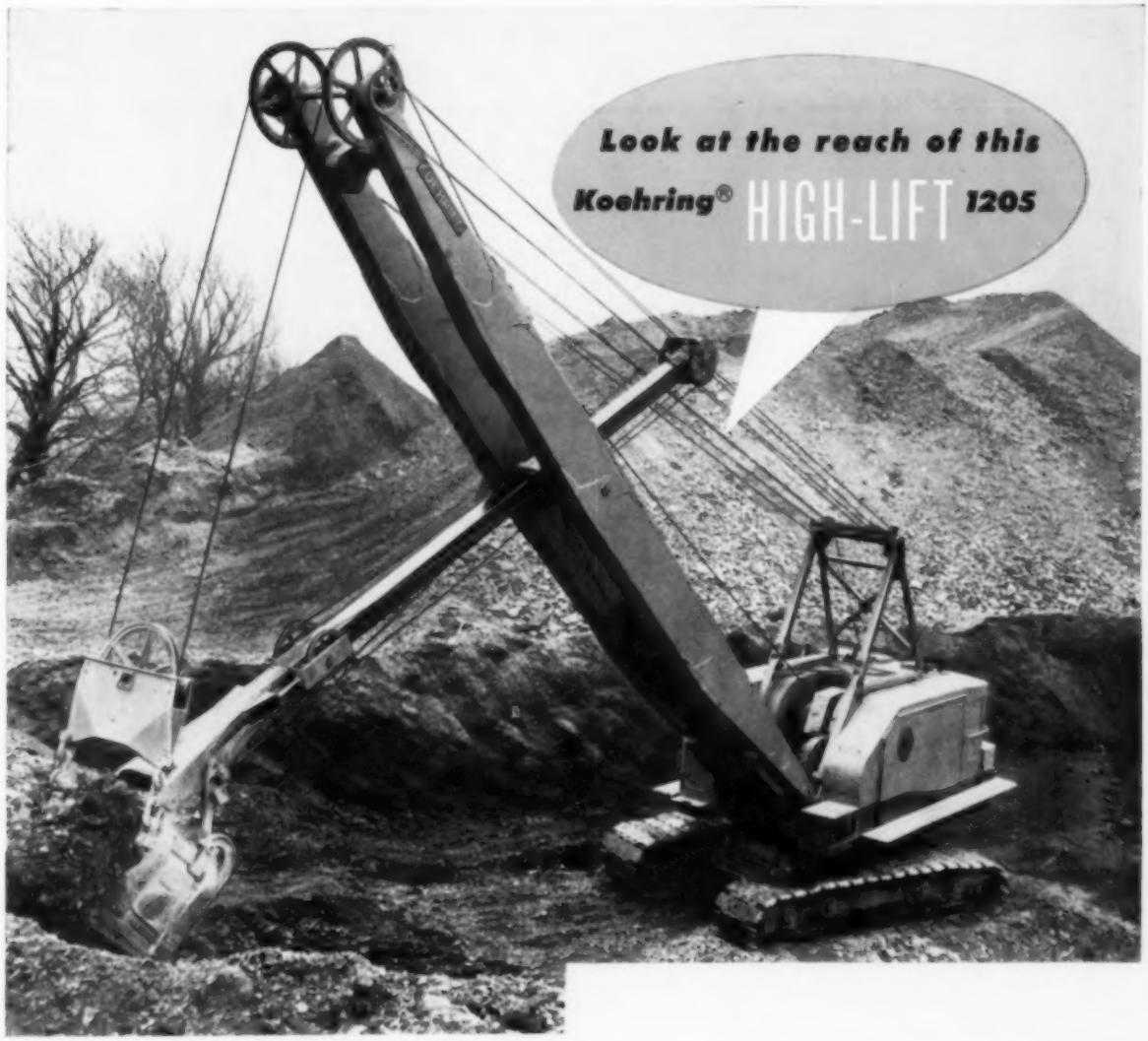
Air Flow Controls Substation

INSTANTANEOUS disconnecting of underground substations at Oakmont mine if the mine ventilation current stops is provided by Dry Sys air-flow switches. One of these units is mounted on the wall at the back of the substation near the regulator door. As soon as the flow of air through the substation is interrupted, the switch breaks the electrical circuit to the substation.



Plastic Pipe Holds Hot Stick

HERE'S an unusual application for plastic pipe. Take a section of plastic pipe, make stoppers with handles for each end and you have a neat container for a hot stick. In each of the Oakmont underground substations one of these containers is mounted on the wall with two iron straps. The hot stick is kept inside the tube and the stoppers are always kept tightly in place. Thus it is always clean and dry when needed to operate cutout switches.



A Koehring 605 dragline strips 35 to 45 feet of overburden at this Mid-West mine. This size machine handles 1½ to 2½-yard dragline or clamshell bucket on wide work radius. The 605 is convertible to a 36-ton lift crane — or 1½-yard shovel (22-foot standard boom or 28-foot high-lift boom).

Here's a heavy-duty shovel in the 2½ to 3-yard class that really puts coal stripping on a long-reach basis! For instance — when equipped with a 2½-yard dipper on 50-foot high-lift boom (above) this big Koehring 1205 has 51-foot-4-inch cutting height at 45° boom angle — and dumps at a height of 40-feet-10-inches. The high-lift 1205 shovel also handles a 3-yard dipper on a 40-foot boom — and gives you 42-foot-10-inch cutting height, and 31-foot-5-inch dumping height, at 45° angle. (For heaviest digging, there's a standard 1205 with 3-yard dipper on 30-foot boom.)

Power, strength and load-stability as a shovel increase the 1205's work capacity with every attachment. Depending on weight of materials, it handles 3 to 4-yard dragline or clamshell buckets on 60 to 170-foot boom. As a crane, it safely lifts up to 95 tons (based on 75% rating). Your Koehring distributor has more information that will interest you. Call him *today,* or write us for 1205 catalog.

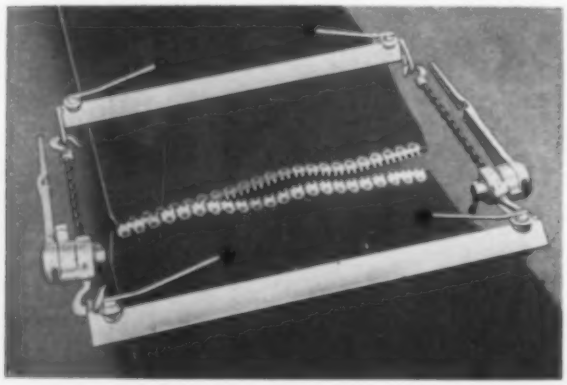
K844

KOEHRING HEAVY DUTY

KOEHRING DIVISION OF KOEHRING CO. Milwaukee 16, Wisconsin

Excavator manufacturing associates located in: CANADA • ENGLAND • SPAIN • JAPAN

Equipment Developments

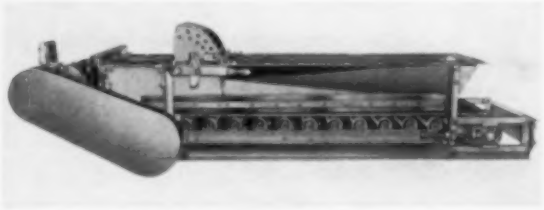


Simple Belt Clamps

If you need a heavy-duty clamp for long conveyor-belt installations under high tension, the new LS-3 "Far-Pul" belt clamp may be the answer. LS-3 is made by Flexible Steel Lacing Co., Chicago 44, Ill., and is best suited for belts 30 to 36 in wide, reports the manufacturer. All steel, the clamp has two pairs of clamping bars, one pair for each belt end. Three parts make up each pair of bars. They are the: V-bar (angle iron), round "gripping" bar and draw-up bolt (handle welded to bolt end speeds tightening). To set up the LS-3, you place the V-bar on top of the belt back from the belt end. The round gripping bar, grooved to hold the belt tightly, is put on the underside of the belt right below the V-bar. You align the threaded holes at the ends of the gripping rod and V-bar, then insert the draw-up bolts and turn them until the belt is locked between V-bar and rod. Standard "pull-up" tools can be purchased for use in drawing belt ends together, states the company, which has a wide line of other "Far-Pul" belt clamps.

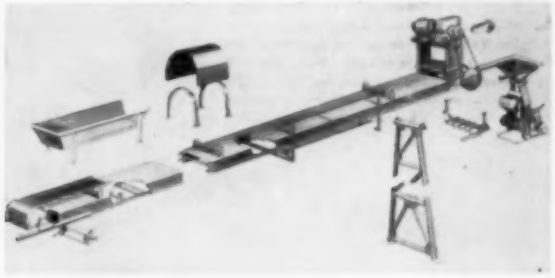
Portable Drilling Rig

A new portable drill for use in the mining, quarry or construction industries, has been announced by George E. Failing Co., Enid, Oklahoma, a subsidiary of Westinghouse Air Brake Co. The manufacturer says the rig is very versatile, the best they have made yet, producing clean, straight holes. The unit sits on a GF-660 crane carrier truck with a GMC 4-71 diesel engine. The truck engine powers the rotary table. The air compressor on the rig is a Le Roi Model 100-S2 and uses power from a GMC 6031-C diesel engine. The rig is made to use both conventional rock or drag bits and also new down-the-hole tools. Three hydraulic leveling jacks are standard equipment on the unit. "We have made thorough tests with this new rig in very hard rock areas and it has produced more holes faster than any similar unit we have manufactured," said E. A. Johndrow, Failing's vice president of sales.



Accurate Belt Feeder

This belt feeder, made by Barber-Greene Co., Aurora, Ill., feeds ores, chemicals and other materials with high accuracy. Model F-8 comes assembled, ready for installation in a track or truck dump hopper, beneath elevated bins or in either a steel or wooden bulkhead. You can choose from two drive arrangements for accurate control of feeder output, states the company. With a roller chain drive it is possible to get constant belt speed. Or you can get a variable speed reducer and roller chain arrangement for changing belt speeds. This variable-speed system enables you to adjust capacity by varying the gate opening or altering the speed of the belt, or both. Because of low head room it is possible to mount the F-8 easily beneath bins or in reclaiming tunnels, adds the firm.



Sectional Belt Conveyor

A sectional conveyor made by Stephens-Adamson Mfg. Co., Aurora, Ill., comes in belt widths of 18, 20, 24, 30 and 36 in, with drives up to 50 hp. This packaged unit, complete with its head and tail assemblies, features bent-plate decking and sells at a competitive level, asserts the manufacturer. Sturdy 12-ft sections of load-tested steel, with bolt holes punched accurately in rows on top, make it simple to erect or alter the conveyor, states the company. The 12-ft sections are said to

for **HIGH** *speed*
in
LOW
seams . . .

CP HYDRAULIC COAL DRILL

Low, tough seams need a light, easily handled Chicago Pneumatic Hydraulic Coal Drill. Weighs only 35 pounds. Drills a 9 foot hole in 30 seconds. With auger speeds less than 1000 RPM, vibration is held to a minimum. Makes long augers easy to handle.

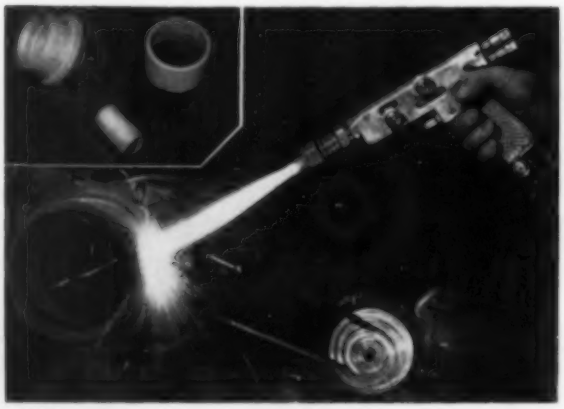
The CP-35-HCD will operate off the power system of cutting, timbering or roof bolting machines. Complete safety—no sparks or shock possible. No kick, no stall. Write for details: *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

AVAILABLE ACCESSORIES INCLUDE: Valves, gauges, junction blocks, hoses and fittings.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

give greater flexibility in lengthening, shortening and altering the conveyor. The decking has its own protection for the return belt run. Return rollers sit on its underside, shielded from weather and falling material. Catwalks, handrail, and other conveyor components such as belt cleaner or holdback are available if desired, adds Stephens-Adamson.

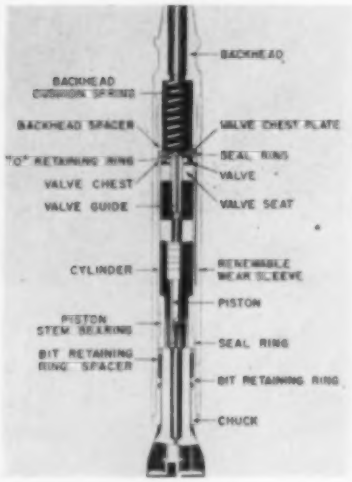


Hard-Surface Spraying

Most mining men are well acquainted with Kennametal cemented tungsten carbides for metal-cutting tools. Now, Kennametal Inc., Latrobe, Pa., announces "Kenspray," a new powder containing tungsten carbide, that can be sprayed on to metal parts to give them hard surfaces. The new powder is said to create a surface with very high wear resistance. It can be sprayed easily onto flat or irregular surfaces. Using standard metal-spraying techniques, you can produce surface coatings of "Kenspray" from .010 to .090 in thickness, asserts the firm.

Tractor Has Six Speeds

The International TD-20, a 134-hp diesel crawler tractor that replaces the TD-18, has a six-speed transmission. Its manufacturer, International Harvester Co., Chicago 1, Ill., points out that with a single lever an operator can shift the transmission through six speed ranges, either forward or backward, making the tractor a major advance in its power class. A separate lever operates the forward-reverse "shuttle bar" control that provides the various speeds. The firm asserts that the design of the tractor cuts down dozing cycle time because operators can doze forward in second gear and return in third or fifth gear. This movement can be accomplished by the natural sweep-shift hand motion of the tractor operator when changing the direction of the tractor. The TD-20 has speeds from 1.5 to 7 mph in forward range and from 1.8 to 8.4 mph in reverse. Drawbar horsepower on this model is rated at 111 with a maximum drawbar pull of 27,500 lb in first gear at 1.5 mph. The 74-in gage tractor has an operating weight of 29,300 lb.



Continuous Cleaning Drill

Ingersoll-Rand Co., New York, N. Y., has announced a design change in its "Depthmaster," "down-the-hole" drill. The change makes possible continuous hole-cleaning air even when the drill is not operating. Even though the drill is shut off, continuous high pressure hole-cleaning air passes through the drill and bit, minimizing sticking of the drill in the hole, prolonging drill life. The manufacturer asserts that this exclusive, patented feature eliminates the need for special exhaust ports in the side walls of the cylinder which can let harmful cuttings into the drill. The "Depthmaster" comes in three sizes for blast holes from 4¾ to 7 in.

Underground Cable

General Electric Co., Wire & Cable Dept., Bridgeport, Conn., is making new Geoprene Y-ground portable cable for AC underground mining equipment. This new cable, asserts the firm, offers protection against phase-to-phase faults encountered with a cable having shielded construction, without the complications of fully shielded cable. It has all the advantages of Type G portable cables plus better mechanical and better electrical properties, says the company.

Telephone for Mines

A simple, efficient loudspeaking telephone for mine communication is a new product manufactured by Femco, Inc., Irwin, Pa. The company says that personnel can page each other over loudspeakers and then talk to each other in natural voice tones. The systems work with existing mine telephone lines and are reported to give clear communication over heavily loaded, noisy or other-

B.F.Goodrich

B.F.Goodrich tires give strip miner 20% more mileage than other makes!

FAUZIO BROS. strips coal in the area around Nesquehoning, Pa. 72 trucks haul loads as heavy as 32 tons up steep, winding mountain roads. Tire failures were common in this grueling work. Then the company switched to B.F.Goodrich tires—today uses 480 of them! Why? Because B.F.Goodrich tires give 20% more service than any other make, reduce road delays, can be retreaded 2 to 3 times!

The new B.F.Goodrich Rock Service tire is a favorite with Fauzio because of its FLEX-RITE NYLON cord body. B.F.Goodrich FLEX-RITE NYLON withstands double the impact of ordinary cord materials, resists heat blowouts and flex breaks. This Rock Service body outwears even the extra-thick tread, can be retreaded over and over.

Husky Rock Service cleats grip the ground for positive traction in forward or reverse. The Rock Service is available in regular tube-type construction, or Tubeless construction that protects against bruise-blowouts and sudden flats. See the complete line of tires for mine work at your B.F.Goodrich dealer's. He's listed under Tires in the Yellow Pages of your phone book. Or write *B.F.Goodrich Tire Co., A Division of The B.F.Goodrich Co., Akron 18, Ohio.*

Specify B.F.Goodrich Tubeless or tube-type tires when ordering new equipment

B.F.Goodrich *truck tires*

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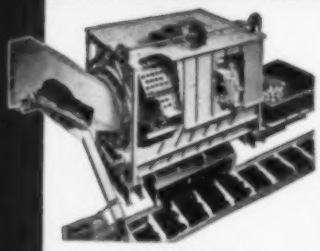
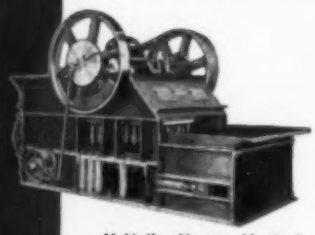
America's most complete line of CRUSHING EQUIPMENT



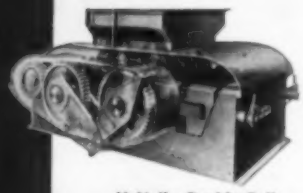
McNally Pittsburg Rotary Breaker

This unit allows positive control of top size in handling run-of-mine washery feed. Production of fines is held to a minimum.



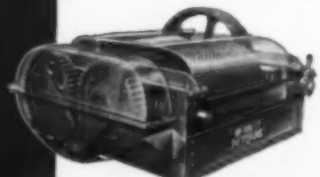
McNally Norton Vertical Pick Breaker

50% Less fines when reducing lump to egg and stove sizes.



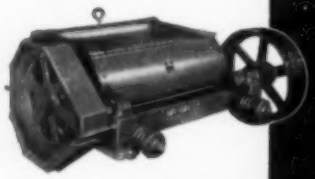
McNally Double Roll Gearmatic ROM Breaker

Built in tonnage ranges from 750 tph to 1400 tph. Full floating gearmatic drive.



McNally Gearmatic Stoker Coal Crusher

This unit offers three prime advantages: high volume production, plus accurate sizing, plus low percentage of fines.



McNally Single Roll Crusher

Universal application 20", 24" and 36" diameter rolls.

AVAILABLE

From Stock and on Short Delivery

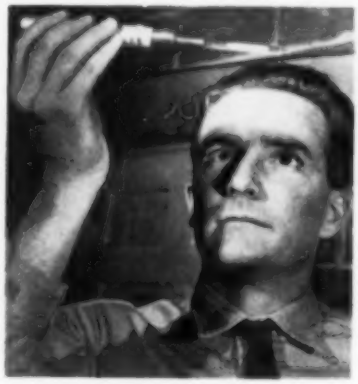
For immediate action on complete information write, wire, or call.

McNALLY PITTSBURG MFG. CORP.

Pittsburg, Kansas Wellston, Ohio

Equipment News *(Continued)*

wise poor lines. The station units, easily installed, consist of compact, self-contained, integral loudspeakers and telephones mounted on wall cases which resist dust and moisture, asserts Femco. A new, 100%-transistorized transreceiver, a dryer and two batteries are enclosed in the sheet-metal housing. A switch on the front panel is for selection of either of two groups for general paging.

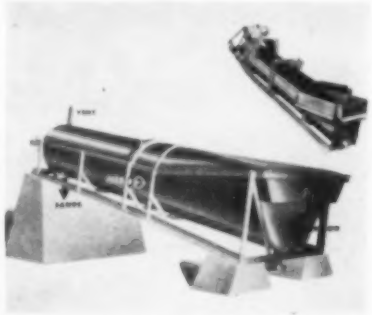


Check Engine Exhaust

An inexpensive carbon monoxide tester for detecting CO concentrations right in an engine's exhaust stream as well as in room atmospheres is a product of Oxy-Catalyst, Inc., Wayne, Pa. The direct-reading unit shows at a glance, asserts the firm, whether carbon monoxide is above or below safe concentration levels and also indicates the approximate percentage concentration. Called the Oxy-Monoxo, it will detect carbon monoxide in the approximate range of 100 to 1,000 parts per million. To operate the detector, a special tube with a chemical is broken off at the end and a pump draws air through the chemical. The CO discolors the chemical, the length of the discolored portion showing the concentration.

Bridge Breaker

Thayer Scale Corp., Pembroke, Mass., has built a new vibrator to break bridging of materials in storage bins, supply ducts and containers. The vibration is not applied directly to the side walls of the hopper or duct, but to screens which are inserted within the chamber and extend downward to the lower opening or discharge outlet. By this arrangement a relatively small mass of steel is agitated to break the bridge of the material between the side walls of the container. The Thayer bridge breaker can be gotten in various sizes and shapes to suit existing hoppers and ducts. It comes in mild steel, stainless steel and teflon coating.



Spiral Classifier

Denver Equipment Co., Denver 17, Colo., has introduced the Denver "Vapor-Tight" spiral classifier based on the firm's "Cross-Flow" classifier principle. The Denver classifier, says the firm, is ideally suited for classification and washing at elevated temperatures because the lower bearing is located above the pulp level. This design overcomes the difficulty experienced with submerged bearing classifiers when pulps have high temperatures or acids attack the bearings and seals located below pulp level. The classifier is capable of retaining pressures to 15 lb

LOOK–they're interconnectable!

O-B "cap screw" cable connectors

*you can connect this...**

- to any other single conductor cable
- either copper or aluminum
- from 4/0 to 1,590,000 CM
- same size or different size
- straight-thru, tap-off, or three-way
- simply by tightening two cap screws!

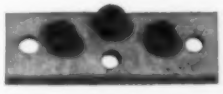
When you leave one of these O-B connector halves semi-permanently attached to the ends of your cable, you can make any of the above connections in a minute or two simply by tightening two cap screws. All connectors have ample strength, current-carrying capacity equal to or exceeding that of the cables themselves. Smooth, slim contours tape easily, drag over rough bottom without snagging. Ask your local O-B representative or write us today for more information.

OHIO BRASS COMPANY • MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

Straight-Thru Connector



Three-Way Plate

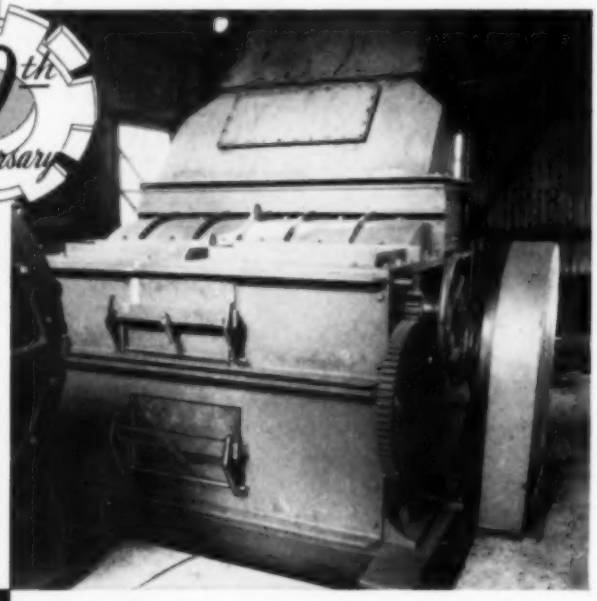
Tee Connector

4829-M

CRUSHING FACTS

from *American* PULVERIZER CO.

50th Anniversary



USER REPORTS

"We've reduced 2,521,000 tons of 2" N & S coal to a ¾" product. Crusher has given satisfactory service. Rings and screens have been renewed only once."

Replacement parts on this American AC-7C Rolling Ring Crusher after crushing 2½ million tons of coal have cost only $0.0016 per ton (1/6th of a cent).

There's good reason for performance records like this. The American originated rolling shredder ring efficiently splits coal instead of crushing it. Coal spends less time in the crusher; therefore, there is less attrition in the crushing chamber and less wear on the screens. Further, the rings are reversible for double wear. In addition, the effectiveness of the crushing elements permit slower operation speeds.

Our engineers will analyze your reduction problem. No obligation to you.

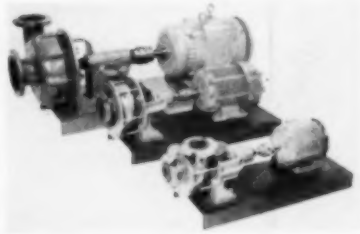
American PULVERIZER COMPANY

PULVERIZERS AND MANUFACTURERS OF RING CRUSHERS AND PULVERIZERS

1119 MACKLIND AVE. ST. LOUIS 10, MO.

Equipment News (*Continued*)

and greater, asserts the company, and the unit can be supplied in acid- and corrosion-proof construction in all sizes from the 6-in lab size to the 60-in diameter spiral size.



Rubber-Lined Pumps

The picture shows the complete line of Camac rubber-lined pumps from ½ to 20 hp. Manufactured by Carl Buck & Associates, Essex Fells, N. J., these centrifugal pumps cover the range from 10 to 1,200 gpm at heads of from 1 to 120 ft. Standard lining is an acid-proof semi-hard rubber suitable for all alkalines and acids except nitric or chromic at temperatures to 210 F. Camac pumps are constructed so that no metal touches the acid pumped. These pumps, states the manufacturer, can be disassembled for repair without disturbing piping as both suction and discharge flanged nozzles are located on the one-piece cast-iron head.

No Peeling

Carbon steel coils, states Guyan Machining Co., Logan, W. Va., used for supporting electrical resistors in mine locomotives, have generally been made of carbon-steel protected with aluminum paint. At high temperatures the paint peeled off, causing premature failure of the resistors, says the firm. Guyan Co. believes it has solved the problem with aluminized steel, Type 1. The aluminum coating of this special metal alloys with the steel base and forms a refractory layer that will not peel or flake off at temperatures up to 1,250 F, asserts the firm.

Unique Conveyor Belt

"Shockmaster," a new conveyor belt made by Quaker Rubber Div., H. K. Porter Co., Inc., Philadelphia, Pa., is built so that the belt can be turned over after the first carrying side is worn out. The belt, asserts the firm, has great ability to absorb and distribute shock. It is a medium-weight, double-duty belt with high impact resistance, adds the firm, for use over smaller than usual pulleys on short-center hauls. "Shockmaster" is made of two- or three-ply, heavy, cotton-nylon fabric with a skim coat of rubber be-

Latest Stoper Drill Development Simplifies Roof Bolting in Low Coal

Le Roi-Cleveland S-20 Vac-Nu-Matic stoper, with new feed principle, is only practical machine in seams from 36" down to 26". Other sizes available for any seam height.

28-inch feed S-20 weighs only 65 pounds. It is the lightest dust-collecting type stoper available—operators say it's easier to use.

The revolutionary S-20 stoper is designed especially to provide a better way of producing roof-bolt holes.

Low coal or high coal makes no difference to this machine. It lets you put your roof-bolts wherever you need them — even in 26-inch coal. And high drilling speed along with light weight and a positive dust-collection system helps your miners get the work done faster.

New feed principle provides low overall height and longer travel. The S-20's feed consists of an air piston combined with a chain in such a way that the travel of the machine is double the travel of the feed piston. As a result, it drills a deeper hole with one steel change than a standard stoper does with two changes.

Because it does away with at least one steel change and in some cases two, this longer travel saves roof-bolting time.

The low overall height is obtained because the S-20 is the only stoper that starts its feed at the bottom of the machine. The starting height, regardless of feed length, is always 16½ inches.

Dust collection is instantaneous. There are no hoods or tubes to handle or adjust, when your miners use the S-20 Stoper. The cuttings and dust are pulled through the drill steel instantaneously and ejected through the side of the chuck housing into the dust box—no cuttings go through the machine itself.

There's complete absence of dust because the S-20 system pulls a high vacuum. It uses only 18 cu. ft. of air at 80 lbs. pressure to pull a static vacuum of 16½ inches of mercury or a fluid vacuum of 13 inches while the machine is running. Wet top presents no problem.

New design speeds roof-bolting operation. The S-20 has been in the field for more than a year, working in all types of coal mines. According to the evidence piled up during this period, S-20 users not only roof-bolt areas heretofore impossible to get at — they also do the work faster.

Features that contribute to this increase in efficiency are: Lighter weight. Low overall height. Longer feed. Positive dust-collection. Fast drilling speed.

Test the S-20 in your mine. See how it reduces roof-bolting costs. A demonstration can be arranged by contacting Schroeder Brothers, 3116 Penn Ave., Pittsburgh, Pa.; Acme Machinery Co., Williamson, West Virginia; Equipment Service Co., Inc., 617 North 9th St., Birmingham, Alabama. Or, you can contact us direct.

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

Yes! . . . it's ALL STEEL

HP RANGE:
½ to 50 hp

RATIOS:
4:1—14:1—24:1 (or 20:1)

OUTPUT SPEED RANGE:
420 to 5 rpm

TORQUE RATINGS:
up to 31,500 lb-in

FALK
ALL STEEL
Shaft Mounted Drive

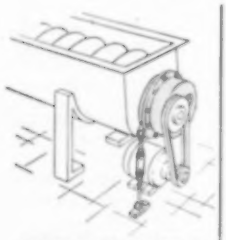
...Steel can "take it"!

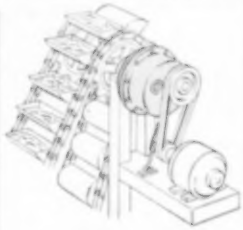
STEEL frame ... of fabricated plate supports all rotating elements—provides double the ability of iron to maintain vital alignment of revolving elements, even under shock load or external impact.

STEEL housing ... will not fracture, serves only as protective cover and lubricant reservoir. Therefore, lubricant supply is safeguarded.

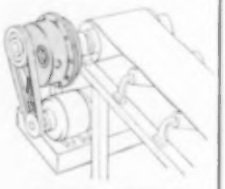
STEEL tie-rod and straddle-mounted tie rod brackets ... are fastened to heavy steel frame by steel bolts in double shear.

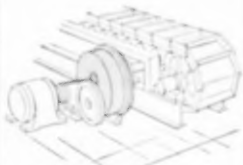
A FEW TYPICAL APPLICATIONS

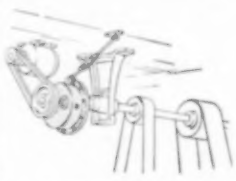

SCREW CONVEYOR


BUCKET ELEVATOR

GRAVEL CLASSIFIER


BELT CONVEYOR


APRON FEEDER


LINE SHAFTING

DELIVERIES TO MEET YOUR REQUIREMENTS

Off-the-shelf delivery **from your Authorized Falk Distributor.** ***Shipment from factory or warehouse stocks*** **within 72 hours after receipt of your order.**

Write for Bulletin 7100

THE FALK CORPORATION, 3001 W. CANAL ST., MILWAUKEE 1, WIS.
Representatives and Distributors in Most Principal Cities
Manufacturers of Quality Gear Drives and Flexible Shaft Couplings

FALK
...a good name in industry

Equipment News (*Continued*)

tween plies. An envelope ply of frictioned, double-skimmed, nylon fabric surrounds the core and acts as a cushion. The top and bottom covers are of a high-quality abrasion-resistant rubber, $\frac{3}{32}$ of an inch thick. In the past, concludes Quaker, once the carrying surface of a belt was worn out the belt had to be replaced, but with "Shockmaster," both top and bottom can be used.

Equipment Shorts

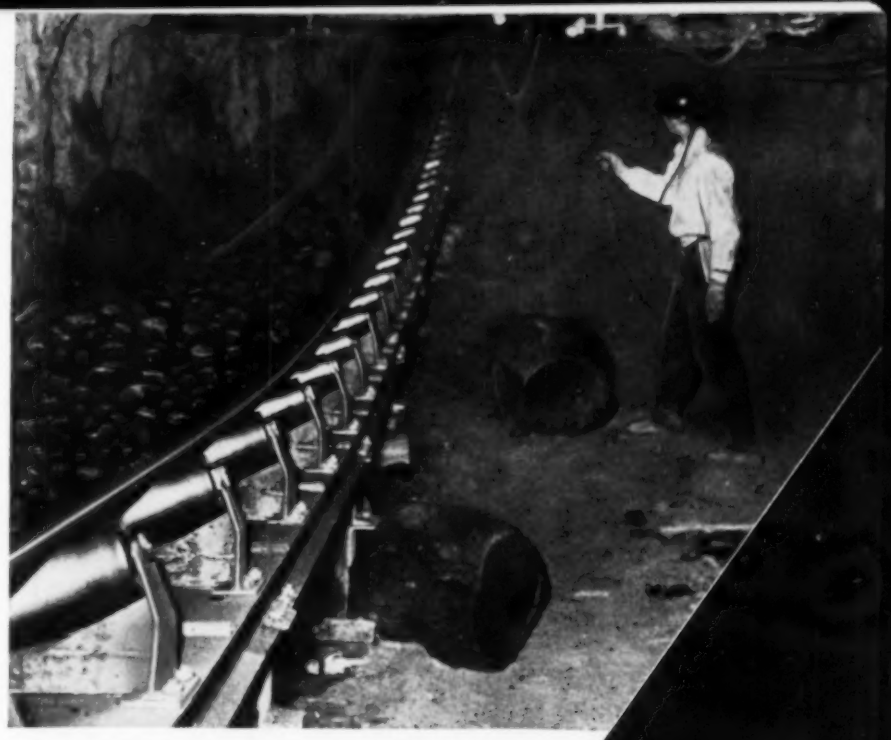
WIRE ROPE—John A. Roebling's Sons Corp., Trenton, N. J., has a new wire rope featuring herringbone construction. They say it's flexible and resists abrasion very well. The firm compares it with Lang lay rope in structual stability, stating that it is just as good. Herringbone rope has two pairs of Lang lay strands separated by two strands of regular lay. It is so versatile, asserts the manufacturer, that it will eliminate the expense and inconvenience of stocking two different types of rope.

NYLON TIRES—General Tire & Rubber Co., Akron, Ohio, is now offering a standard line of truck tires with Nylon cord construction. The line is called "Traction Rib Special Service," and is said to give 10% greater mileage than the tire it replaces, with no change in price. For truck, tractor and trailer use, the tire can be got in twin bead sizes.

ENGINE STARTING—Wilco Co., Los Angeles 23, Cal., has turned out a liquid that aids the starting of gasoline or diesel engines. The company says that this fluid, "Sure Fire," is possessed of a super-hot formula that will get your engine going no matter what kind of weather you're working in. Many oil companies and engine manufacturers have tested this formula with a low ether content, and it has been found to save a lot of money on repairs, parts, batteries and standby time, states Wilco.

RUGGED STEEL—U. S. Steel Corp., Fairfield, Ala., is publicizing a new steel called USS "T-1," said to offer customer cost savings up to 10%. This low-carbon, quenched and tempered alloy steel has a high tensile strength that enables it to take more stress, states the company. The minimum strength yield of the steel (point at which metal stretches) has been increased from 90,000 to 100,000 lb per sq in, they say.

SAFETY GLASSES—American Optical Co., Southbridge, Mass., has three new onyx on crystal spectacle-type safety glasses having frames with new safety features. Patented eye-wire has a specially developed groove which not only



Thermoid Belting

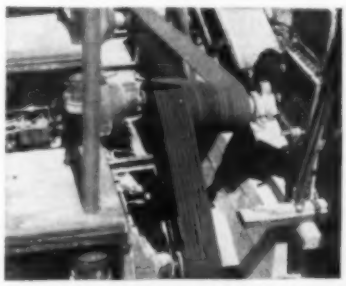
is built to take it... underground!

This is especially true of fire-resistant Thermocoal—the belt that bears acceptance designation #28-13 of the U. S. Bureau of Mines.

You'll not only have a belt that meets or exceeds all after-flame and after-glow tests . . . you'll also benefit from typical Thermoid toughness. Thermocoal Belts are engineered for high resistance to flexing and impact, edge wear, abrasion and mildew. You can specify either 4 or 6 ply construction of the strongest cotton or cotton-nylon duck—impregnated with specially compounded Thermoid rubber stocks to assure longer life, lower costs.

Your Thermoid Distributor can help you select the belting that meets your requirements. Contact him . . . or write direct for detailed information and data sheets.

Make Thermoid your choice, too, for Multi-V Belts . . .

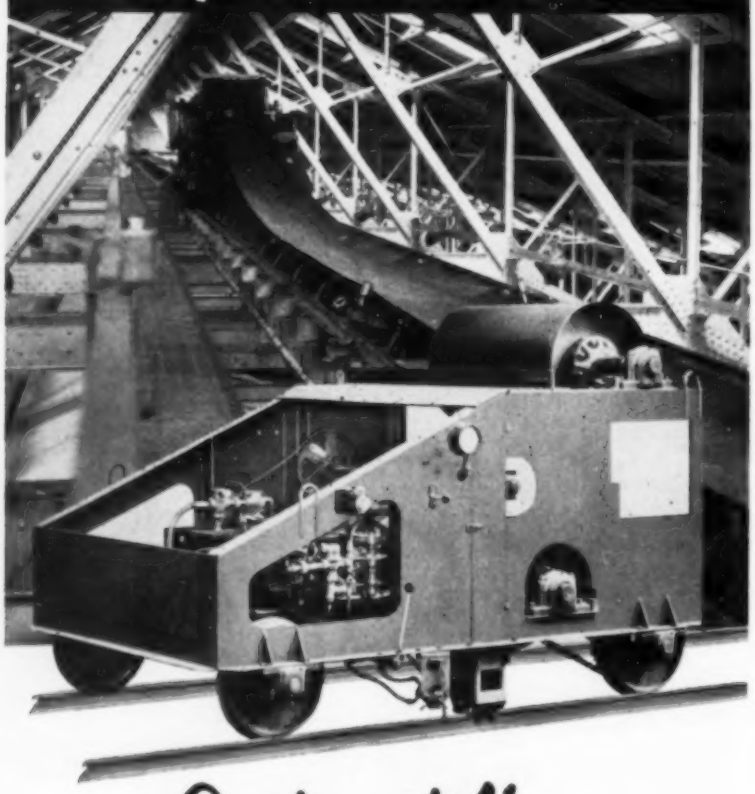


. . . and Hose manufactured with your needs in mind.

Thermoid

Thermoid Company
Trenton, New Jersey
Nephi, Utah

Handling CHILEAN NITRATE Safely..



-with Continentals' patented

Hydraulic Tripper

For handling explosive and/or hygroscopic materials, Continental's Patented Hydraulic Tripper offers unique advantages —

- The unit is belt-powered through a hydraulic motor to the tripper wheels.
- Equipped with hydraulic controls throughout.
- Fully enclosed hydraulic system.
- No electric trolley wires — no cable reels — with resultant explosion hazards and extra maintenance.
- No clutches or friction drives to corrode during down time.
- Hydraulically-operated spring-set brakes provide tripper positioning without creep, crawl, or accidental release.

If your material handling requirements are unusual, Continental has the answer. Call, wire, or write your nearest Continental office.

ATLANTA • DALLAS • KNOXVILLE CGC MEMPHIS • MOBILE • NEW YORK 17

INDUSTRIAL DIVISION

Continental Gin Company

BIRMINGHAM ALABAMA

Equipment News (*Continued*)

holds the lens securely, states the firm, but is designed to support the lens against being driven backwards towards the eye when struck. If the lens should be broken by unusually heavy impact, adds the firm, the fragments are held together.

WELDER-COMPRESSOR—Hobart Bros. Co., Troy, Ohio, offers a self-propelled unit for operations with both arc-welding current and compressed air. Mounted on the rear is a 125-cu ft rotary compressor driven by a 4-cylinder gasoline engine. The compressor is self-contained with the exception that it draws its gasoline from a common fuel tank. The welder is a 600-amp, DC unit driven by a Chrysler V-8 engine. This unit is equipped with hydraulic power steering.

SLIDE GATE—Ducon Co., Inc., Mineola, N. Y., has produced a new design of slide gate for use as an unloading and shut-off valve in dry-dust collector hoppers, storage bins and transport lines. The gate is said to provide positive, gas-tight, dust-tight seal when closed, is non-sticking, and has free sliding action with no close tolerances. When the gate is open no part of the gate mechanism is in the path of the discharging material, assuring free flow.

Free Bulletins

PROTECT WIRING—Electri-Flex Co., Roselle, Ill., has put out a data sheet on its "Liquatite," a flexible wiring conduit that is liquid tight to protect wiring circuits from oil, chemicals, water, corrosive fumes, vapors, grease, dirt or any other material that may be harmful. The data sheet tells all about the new, heavy, square locked galvanized metal tubing with a tough extruded outside covering of vinyl plastic. It also includes specifications and possible uses for the product. The sheet will be mailed to you along with samples and prices on request.

CIRCUIT BREAKERS—I-T-E Circuit Breaker Co., Philadelphia, Pa., will send you a 20-p booklet with complete information on the use of current-limiting "Cordon" circuit breaker for short-circuit protection on low-voltage systems. The circuit breakers, with an interrupting rating of 100,000 amps, combine in one compact device the conventional over-current tripping features of I-T-E molded-case circuit breakers and the current limiting ability of Chase-Shawmut Amp-traps, according to the firm.

FLEXIBLE TUBING—Pennsylvania Flexible Metallic Tubing Co., Philadelphia, Pa., offers a new technical data booklet covering all types of flexible tubing and

The "Autolimer" is made by the Shirley Machine Company, 725 Liberty Avenue, Pittsburgh 22, Pa.

New neutralizer for mine water constructed of USS Stainless Steel

Lime and acidic mine water are mixed in the stomach of the "Autolimer." Powered only by the water that flows through it, this machine dumps measured amounts of lime into the drain water to neutralize it and prevent pollution of streams.

A constant diet of lime and acid would quickly eat away most materials. That's why the major parts of the "Autolimer" are made from Stainless Steel. Stainless resists corrosion, it's hard and abrasion resistant—therefore it gives long service in the toughest mine jobs.

If corrosion and wear have damaged equipment at your mine, replace it with Stainless Steel. It cuts maintenance and it often eliminates replacements completely. Write to us for full information about Stainless Steel equipment for mine work. United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

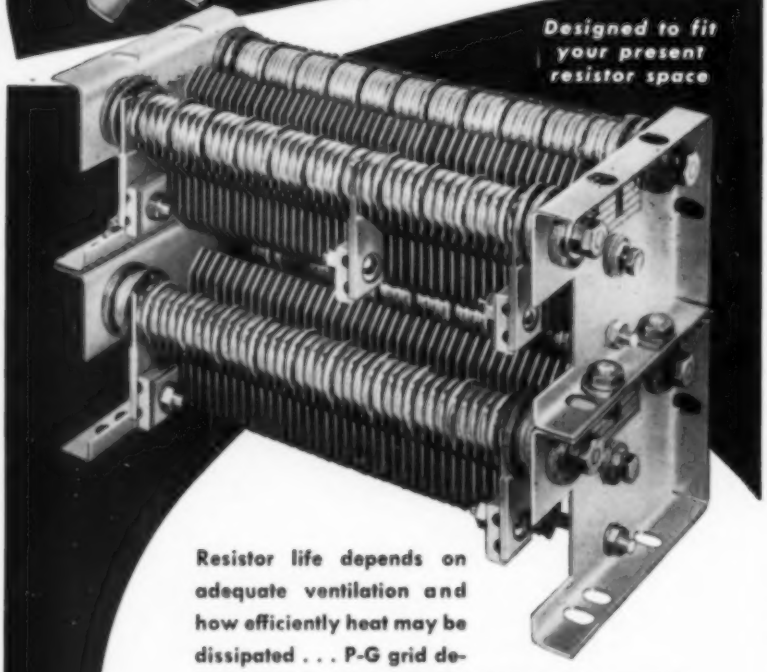
United States Steel Corporation—Pittsburgh
American Steel & Wire—Cleveland
National Tube—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Warehouse Distributors
United States Steel Export Company

USS United States Steel

TRADEMARK

Resistor life depends on adequate ventilation...

Patented P-G Grid Design assures maximum ventilation



Designed to fit your present resistor space

Resistor life depends on adequate ventilation and how efficiently heat may be dissipated . . . P-G grid design equalizes the amount of air space surrounding each leg or loop to obtain even heat throughout the grid area. (Note illustration.) . . . Since heat is rapidly and evenly dissipated, hot spots fail to develop and longer resistor life is assured . . . For a nonbreakable resistor (only steel and mica used) specify P-G on your next application.

P-G

The Nonbreakable Steel Grid Resistor

THE **POST-GLOVER** ELECTRIC COMPANY

OFFICE and FACTORY—Kenton Lands Road, Erlanger, Kentucky

MAILING ADDRESS—Box 709, Covington, Kentucky

Equipment News (*Continued*)

hose together with the many types of couplings which can be used with the tubing. The brochure points out the value of and steps in the proper application of tubing to all types of industrial installations—explains "flexineering" and how it can save money, time and labor. "Flexineering" is the proper application of tubing in conveying air, water, steam gases, volatiles, granular materials and all types of liquid.

CLAMPS—Aeroquip Corp., Marman Div., Los Angeles, Cal., has an attractive file folder covering its line of clamps, couplings and joints for industrial uses. The brochures provide detailed data on applications, sizes and dimensions of products, and are illustrated with photographs, and dimensional diagrams. Installation instructions are also included.

SHOVEL—Link-Belt Speeder Corp., Cedar Rapids, Iowa, has a new, 24-p catalog, No. 2553, covering the full one-yard LS-98 shovel, crane, dragline and hoe. With its introduction in 1954, says Link-Belt, the LS-98 created a new shovel-crane market—the full one-yard class for shovel, crane, dragline and hoe operation. This new book, with large photographs, depicts the LS-98 in detail from the crawler tracks to the upper machinery and the various front attachments, states the company.

COAL CRUSHER—American Pulverizer Co., St. Louis, Mo., announces a 4-p bulletin with illustrated descriptions of the special construction elements of the feeding and crushing action of American WC's and WS's; tables list pertinent information on capacities, horsepowers, speeds and dimensions for both series. Also included is a survey of actual users in the field that covers parts replacement costs, and total tonnage costs.

ROPEBELT CONVEYOR — Goodman Mfg. Co., Chicago, Ill., has a 7-p booklet on its new, ropebelt conveyor. They state that it is the first and only conveyor on the market with full flexibility, that adjusts to increased loads without spillage and permits carrying idled rolls to be in training contact with belt regardless of load or when the belt is empty. The booklet is full of photographs, tables and diagrams, giving the story of the new conveyor fully.

WATER PROBLEMS—Roy F. Weston, Inc., Newton Square, Pa., offers a booklet describing the service it can offer. The firm specializes in water supply, industrial water pollution control, sewage treatment and air pollution control. It also includes a list of industries served and details of the qualifications of top staff members.

Now, More Than Ever, You Can't Buy a Tire that Costs Less Per Mile Than Firestone!

Firestone scientists and engineers took a long step into the future to develop Firestone Rubber-X. It's a brand-new kind of rubber . . . and it's going to revise all of your present ideas about truck tire wear and performance.

Exhaustive tire tests proved conclusively that truck tires made with Firestone Rubber-X resist the abrasion and wear that shorten the life of ordinary tires. On drive wheels or free-rolling wheels truck tires built with Firestone Rubber-X will give you the lowest possible cost per mile. Try them on your *toughest* wheel position.

Buy *tubed* or *tubeless* truck tires with Firestone Rubber-X in any cord . . . Firestone S/F (Shock-Fortified) nylon or rayon, or STEELCORD® by Firestone. Firestone Rubber-X is yours at *no extra cost*. See your Firestone Dealer or Store now.

TRANSPORT® SUPER ALL TRACTION®

Firestone

BETTER RUBBER FROM START TO FINISH

Copyright 1958, The Firestone Tire & Rubber Company

Among the Manufacturers

Branching Out

Bird Machine Co., designers and builders of solid-liquid separating equipment, has set up a branch office in Atlanta, Georgia, in order to provide improved application engineering and service on Bird coal filters, Bird-Humboldt Oscillating screen centrifuges and other centrifugal and filtration equipment.

Sales and service engineering on this equipment for coal and other mining operations in the South will be under the direction of **Roger W. Day.** Mr. Day is a graduate chemical engineer and has been with Bird Machine for nearly 10 yr.

New Horizons

Link-Belt Co.'s subsidiary Link-Belt Speeder Corp. of Cedar Rapids, Iowa, will begin building a new plant in Woodstock, Ontario, on June 1.

The new Canadian facility will manufacture power cranes, shovels and draglines on a 39-acre site acquired late in 1956. The subsidiary, called Link-Belt Speeder (Canada) Ltd., will consist of two crane bays comprising some 32,000 sq ft of space.

NEW SPEED AND DRILLING ECONOMY
WITH THE NEW IMPROVED

Parmanco

MODEL CD-51-57

COAL AND CLAY DRILL

- Augers Rotated by Vickers 21.5 H.P. Fluid Motor with Hydraulic Feed Finger Tip Controlled
- Cutting Shield And Guide Completely Automatic
- Drill Powered By 65 H.P. Water Cooled Motor.

Jack Foehrer, Pit Foreman says

"THE PARIS DRILL IS THE BEST WE HAVE EVER USED."

SEND FOR COMPLETE DETAILS

PARIS MANUFACTURING CO. PARIS, ILLINOIS

William J. Fox has been elected vice president for the field of technological growth at Dorr-Oliver, Inc.

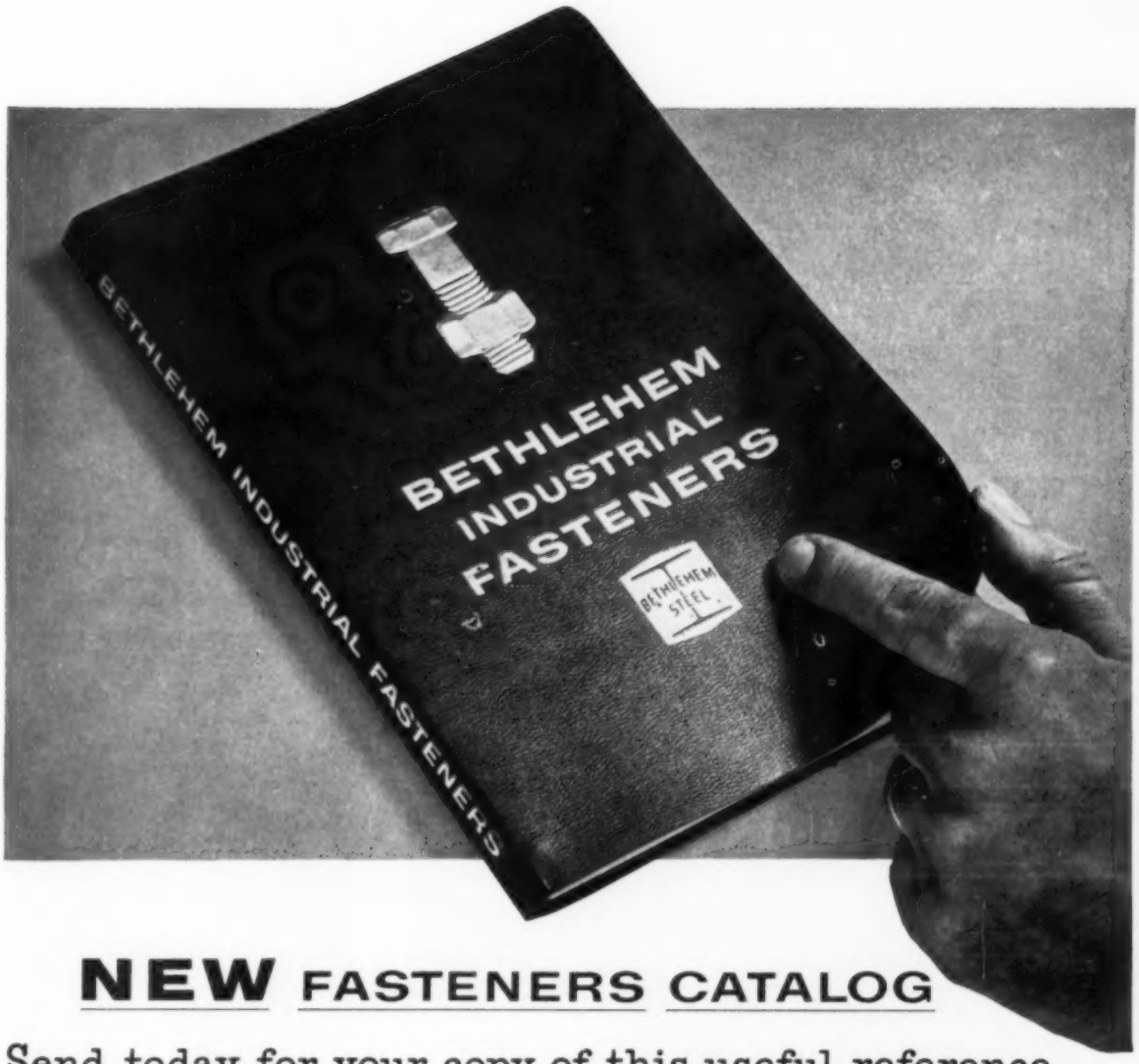
A new D-O plan for accelerated technological advancement is designed to free top research staff members from administrative duties so that their professional abilities may be devoted to scientific work. In his new post, Mr. Fox will administrate all research and development activities and functions as well as those of the legal and patent departments. He is a graduate of Holy Cross College in chemistry and a graduate of Brooklyn Law School. Mr. Fox joined Dorr-Oliver in 1949 after teaching chemistry at Bridgeport Engineering Institute and Pratt Institute.

Allis-Chalmers has appointed Richard R. Goetz as service manager—midwest region.

Mr. Goetz came to Allis-Chalmers in 1951 with a bachelor degree in mechanical engineering from the University of Alabama. He was previously a service supervisor at Allis-Chalmers' West Allis works.

D. B. Currence has been named as southern regional manager for Euclid Div., General Motors Corp.

The new regional manager will maintain headquarters in Atlanta, Georgia. He will guide the activities of district representatives in working with distrib-



NEW FASTENERS CATALOG

Send today for your copy of this useful reference, the most complete edition ever issued!

Bethlehem has just issued "Industrial Fasteners," an illustrated catalog on headed and threaded fasteners. Handsomely bound, this 164-page catalog is attractively printed in two colors; and it is packed with data on just about every type and size of fastener imaginable. List prices, dimensions, weights, and container quantities are also included.

If you have not yet received your copy, use the accompanying coupon. Simply print your name and address, clip the coupon, and mail it direct to us at Bethlehem, Pa.

Publications Department, Room 1031
Bethlehem Steel Company
Bethlehem, Pa.

Gentlemen:
I would like to have a copy of "Industrial Fasteners," your new 164-page catalog (No. 436) on headed and threaded fastener items.

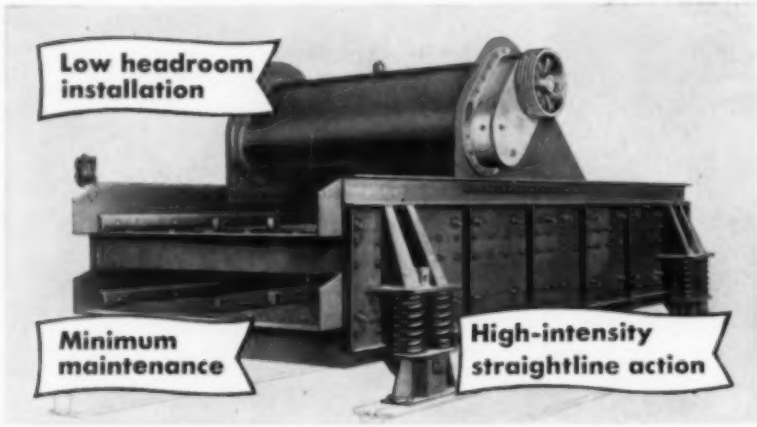
*Name*_____ *Title*_____

*Company*_____

*Address*_____

*City*_____ *Zone*_____ *State*_____

NEW LINK-BELT STRAIGHTLINE horizontal vibrating screens



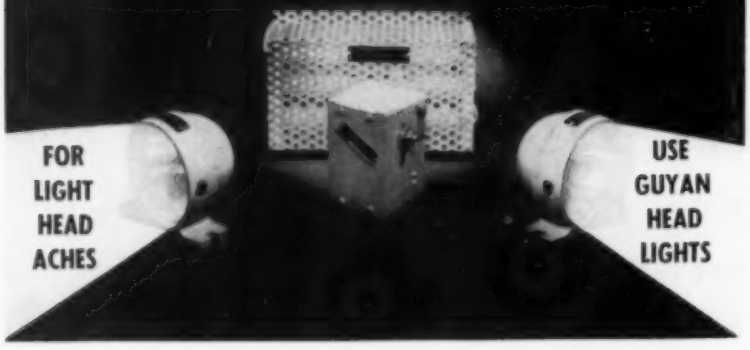
For dewatering, washing and sizing of materials—Link-Belt Straightline horizontal vibrating screens assure maximum capacity for size of screen cloth.

A centrifugal force, unbalanced shaft vibrator produces the high-intensity motion necessary for efficient separation. Suspension or floor mounted, these lower profile units can be installed in locations where headroom is limited. To learn more about the benefits of horizontal screening, call or write your nearest Link-Belt office.

LINK-BELT
VIBRATING SCREENS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 14.070

AN UNBEATABLE COMBINATION



GUYAN SEALED BEAM HEADLIGHTS
PAR-46 Sealed Beam bulb with either 6, 32, 115 lamp voltage, encased in steel

GUYAN HEADLIGHT RESISTORS
Custom Designed, operates on 250, 300 or other voltage for longest life

GUYAN MERCURY TUBE HEADLIGHT SWITCH
With extra capacity, contols your light requirements for safest operation

Manufactured By

GUYAN MACHINERY COMPANY
BOX 150 LOGAN, W. VA.

Manufacturers *(Continued)*

utors in the region that includes Texas, Arkansas, Louisiana, Mississippi, Alabama, Kentucky, Florida, Georgia, North Carolina, South Carolina, Tennessee, West Virginia, and Virginia.

James F. Ham has been appointed a product line manager for the Safety Products Div. of Mine Safety Appliances Co.

Mr. Ham, formerly a supervisor in the marketing division of H. H. Heinz Co., received his BA and MA degrees at Harvard University. He is a native of Portland, Maine, and served with the First Infantry Division in Europe during World War II.

A. K. Boszhardt has been chosen as supervisor, crushing machinery sales, for Allis-Chalmers' Processing Machinery Dept.

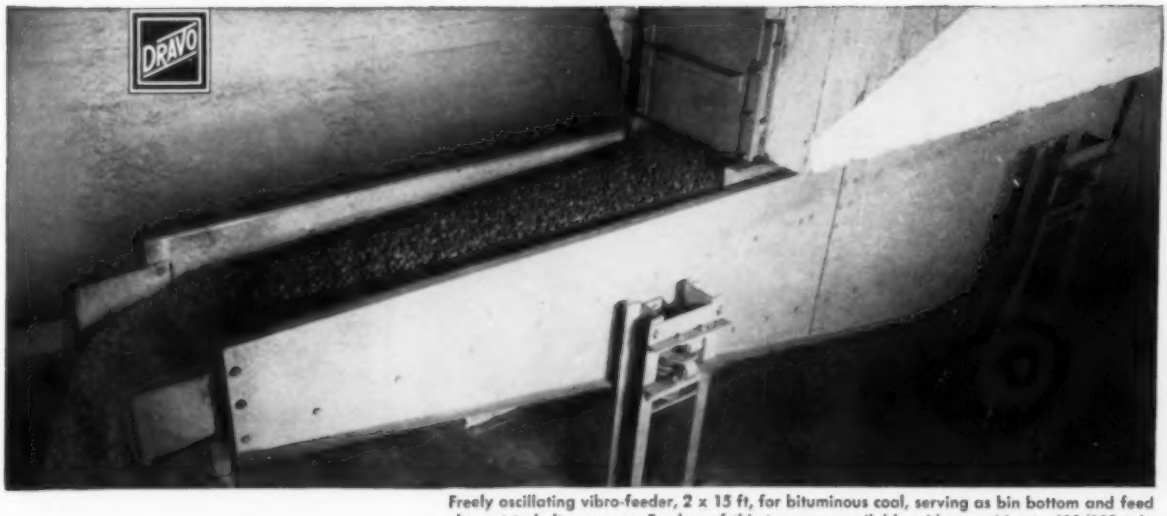
Mr. Boszhardt, who had been an application engineer in grinding machinery sales, joined Allis-Chalmers in 1948. He is a mechanical engineering graduate of the University of Wisconsin.

Louis A. DePolis has been named vice president in charge of marketing for LeTourneau-Westinghouse Co., according to president Merle R. Youtz.

Mr. DePolis comes to LeT-WesCo from the Industrial Truck Div. of Clark Equipment Co., where he has been director of sales since 1953. In his new position, Mr. DePolis will direct not only the company's sales organization, but also supervise and coordinate all marketing and marketing-related activities including those of sales promotion, advertising, equipment service and field engineering.

Coalorerok Machinery Agency, Birmingham, Ala., has been appointed representative in Alabama for the Long Co., manufacturers of mining machinery and conveying equipment.

The Coalorerok organization is headed



Freely oscillating vibro-feeder, 2 x 15 ft, for bituminous coal, serving as bin bottom and feed element to belt conveyor. Feeders of this type are available with capacities to 600/800 tph.

Dravo-Schenck Vibro-Feeders CUT MATERIALS HANDLING COSTS

Because it is built to stand up under the punishment that hot, abrasive or other hard-to-handle materials deal out, Dravo-Schenck vibro equipment keeps maintenance costs down. All wearing parts are ruggedly built, and the unique "Micro-Thrust" exciter unit reduces wear by moving material with minimum contact with troughs or screens.

Cost-cutting, heavy-duty Dravo-Schenck screens, conveyors and feeders are at work in a wide variety of applications—handling such difficult materials as coal, ferrous and non-ferrous ores, sinter, chemicals, cement clinker, and crushed stone.

Our engineers will gladly work with you on specific problems. For information, write for Bulletin No. 1475, Dravo Corporation, Pittsburgh 22, Pennsylvania.

DRAVO
CORPORATION

Zone Your Mail...To Speed Delivery

Changing your address?

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Requesting information?

Then, be sure to use your postal zone number when writing. And not just to us. Use the zone number in every address that needs it.

To speed the mails, the Post Office has created postal zones in 106 cities.

So, if you live in a city with postal delivery zones, please help us get your mail to you quicker. Always use your zone number when writing.

This Ad Donated by COAL AGE in the Interest of Better Postal Service

NO CONCRETE PIT!

Easiest to MOVE!

PORTABLE TRUCK SCALES

Engineered for rugged use in the field. Low initial cost, no maintenance. Can be used as PITLESS SCALE saves on pit costs.

CAPACITIES: 20 to 52 tons. DECK LENGTHS 18 to 43 ft.

OTHER THURMAN SCALES: Pit • Warehouse • Industrial • Liquid Weighing • Wheelbarrow • Batching • Automatic

Precision Scales since 1918

THURMAN SCALE COMPANY

156 N. 5th St. Dept. CA-7 Columbus, Ohio

The Skillfully Engineered

REINEVELD Centrifugal Dryer

Sets New High Standards

High centrifugal forces imposed on the feed particles by the high-speed spinning motion of the drying elements make the Continuous Reineveld Centrifuge an efficient and economical dewaterer for slurries containing —3/8" solids concentrations of 50-80% by weight.

Many satisfied users are placing repeat orders. They know from experience that for best results... drying rate... capacity... low operating and maintenance cost... they must rely on the dependable **REINEVELD Fine Coal Dryer.**

For complete details, consult a Heyl & Patterson Sales Engineer.

Heyl & Patterson INC.

55 FORT PITT BLVD., PITTSBURGH 22, PA., COurt 1-0750

Manufacturers *(Continued)*

by **J. L. Thomas**, who has had many years' experience in the coal-mining industry. He was with Jeffrey for more than 20 yr and, prior to his present affiliation, was employed by National Mine Service Co.

Elmer J. Renner has been named vice president in charge of engineering by Stephens-Adamson Mfg. Co.

Since Mr. Renner started with Stephens-Adamson in 1943 he has been instrumental in getting patents granted on the balanced natural frequency conveyor and has worked on the development of such S-A products as the continuous weigher, box car unloader, pre-engineered sectional belt conveyor and knittle crusher. After his tour of duty with the U. S. Navy in World War II, Mr. Renner held the S-A positions of research engineer, manager of the research and development division and superintendent of the engineering division shops.

Alexander Dreisin has been named chief engineer, Fuel Injection Dept., at Harvey, Ill., announces Allis-Chalmers Mfg. Co.

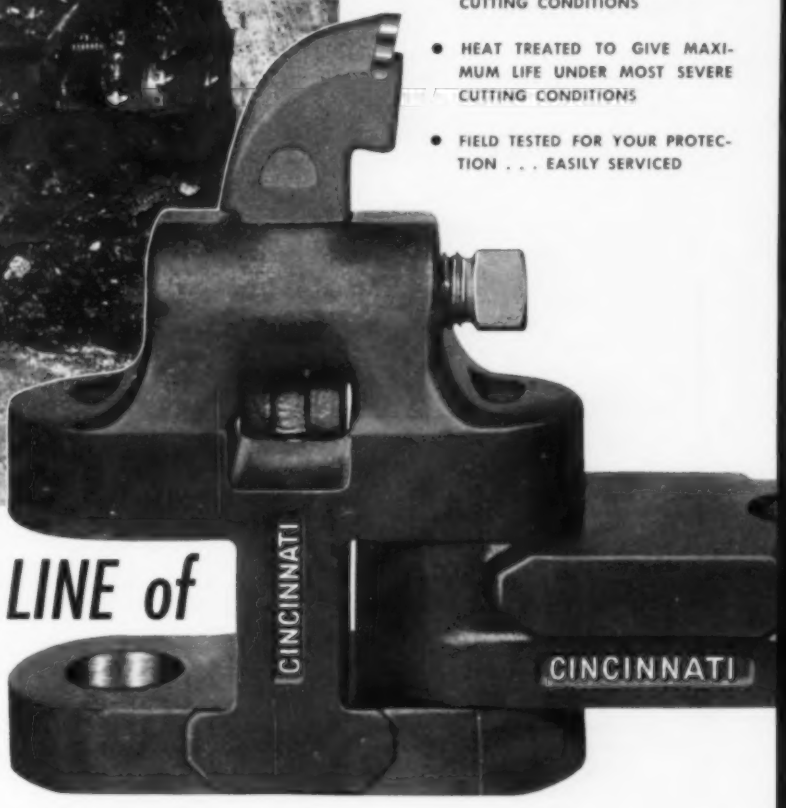
Mr. Dreisin has been with the Micromatic Hone Corp. as chief engineer and has been assistant chief engineer of the Diesel Engineering Manufacturing Co. He received his Ph. D. in mechanical engineering from the Royal Institute of Engineering, Rome, Italy, in 1936. Since then he has been active in the design and development of hydraulic and fuel injection systems.

J. W. Adams has been appointed manager of V-belt sales for the Goodyear Tire & Rubber Co.

Mr. Adams will operate from the firm's belting plant at Lincoln, Nebraska. He joined the Akron rubber firm in 1943 as an industrial products clerk and became Pittsburgh district manager in 1949.

NEW ADDITION

- LARGER . . . EXTRA RUGGED FOR HEAVY DUTY
- SPECIALLY DESIGNED FOR TOUGH CUTTING CONDITIONS
- HEAT TREATED TO GIVE MAXIMUM LIFE UNDER MOST SEVERE CUTTING CONDITIONS
- FIELD TESTED FOR YOUR PROTECTION . . . EASILY SERVICED



to the CINCINNATI LINE of TRIMMING CHAINS and GUIDES... *for BORING-TYPE CONTINUOUS MINERS*

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Gives top performance under normal cutting conditions. Where cutting conditions are tough we recommend the larger, more rugged CINCINNATI EXTRA HEAVY DUTY TRIMMING CHAIN INSTALLATION as illustrated.

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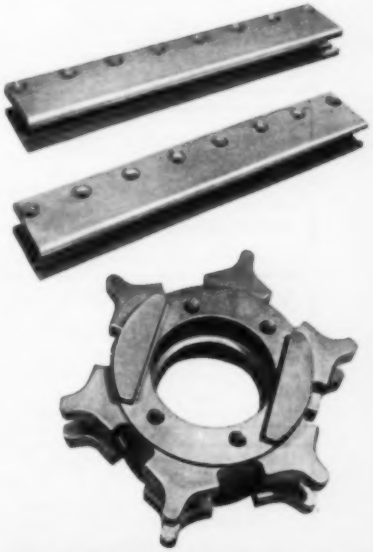

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1—8BU 500 Volt DC
2—8BU 250 Volt DC, Rebuilt
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1—3ZE16 Joy Shuttle Car
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1—PL11-7PE Joy Elevator
1—PL11-8PE Joy Elevator
2—Acme Self Propelled, 40 h.p., Air Compressors, Per.
1—50 h.p., Acme, 210 CFM, Compressors, 30" high
3—Joy Y12 Supply Jeeps, Battery, complete w/Batteries & Chargers
1—RBD30 Chicago Pneumatic Roof Bolt Machine
3—MSA Bantam Rock Dusters on tires
1—350 Goodman Loader, rubber mtd.

CONVEYORS
963'—48" Belt Conveyor-Complete
500'—36" Joy Limberoller Belt Conveyor complete—Unit almost new
1800'—36" Joy Belt Conveyor—Complete
8—36" Joy Belt Drives, Complete
2000'—36" Barber Green Belt Conveyor Like New
8—1000' centers, 97HC Goodman Belt Lines, Complete w Drives, Belt, Etc.
9000'—30" Jeffrey 52B Structure
2080'—30" Barber Green Structure
900'—26" Joy Belt Conveyor
1000'—26" Jeffrey 52B Belt Conv.
24—26" Belt Drives of various types
500'—24" Goodman Belt Conveyor—complete
15—20" Joy Chain Conveyors, Permissible
2—15" Joy Chain Conveyors, Permissible
18—15" & 12" 61EW, 61HG, 61W & 61AM Jeffrey Chain Conveyors
8—G12½ Goodman Shakers, complete w/10', ±1 pans
52—G12½, G15 & G20 Goodman Shakers AC & DC
2—PT12 Long Piggyback Conveyors
31—Goodman Power Duckbills, Model 477
2—PT15 Long Piggyback Conveyors Late Type

CUTTING MACHINES
4—7AU Track Mtd. Sullivans
3—7B Sullivans
12—11B Sullivans, 35 & 50 h.p.
8—12AB & 12AA Standard Goodmans
3—11AA Universal Goodmans
10—21AA Baby Goodmans, 250 Volt
1—21263 Baby Goodman, 220 440 V.
5—512 Goodmans, 3 w/Bugdusters
1—712 Goodman
1—824 Goodman, 42" t.g.
1—29U Jeffrey, 250 Volt
1—29U Jeffrey, 220 440 Volt, Track Mounted
49—35B & 35BB Jeffrey, AC & DC, Bugdusters & Trucks Available

LOCOMOTIVES
1—3 Ton Locomotive, 250 Volt
16—4 Ton Locomotives, 250 Volt any gauge
1—5 Ton Locomotive, 250 Volt
4—6 Ton Jeffreys, MH150, 27" overall height
51—6 Ton Locomotives, any gauge
1—10 Ton Battery Locomotive—New
1—7 Ton Jeffrey
14—8 Ton Locomotives, 250 Volt, any gauge
5—10 Ton Locomotives, 250 Volt, any gauge
8—13 Ton Locomotives, 250 Volt, any gauge
2—20 Ton MH77 Jeffreys, 42" t.g.

SUB STATIONS & TRANSFORMERS
1—75KW Buda Diesel, w 250 Volt Generator
1—100KVA Gasoline Generator Unit
1—100KW Buda Diesel, w 250 Volt Generator
1—100KW UD24 International Diesel, w 250 Volt DC Generator
1—150 KW Rotary Converter—Completely Auto.
14—150KW MG Sets of various makes and primary voltage
2—200KW, GE HCC6, 2300/4000 V Rotary Conv.
4—200KW MG Sets
2—300KW G.E., MG Sets
1—500KW G.E., MG Set
2—Armatures for 150 & 200KW Rotary
2—600 & 800KW Auto Transformers
106—Transformers of various sizes

TIPPLE EQUIPMENT
2—Complete Tipples, including Cleaning Plant, Conveyers, Crushers, Bins, Etc.
3—American Air Tables for Stoker and Carbon
1—4 Colt Jeffrey Baum Jig Washer BARGAIN PRICE
1—CMI Coal Dryer, 48", Excellent
1—Heat Dryer—complete
1—Marion Double Roll Primary Crusher
1—24"x50" Pn. Single Roll Crusher
1—36"x36" Double Roll Crusher
1—24"x30" Double Roll Crusher
1—24"x24" Single Roll Crusher
1—24"x20" Jeffrey Flextooth Crusher
1—24"x20" Jeffrey Single Roll Crusher
1—18"x12" Jeffrey Pulverizer
1—5'x14' Double Deck Vibrator
2—4x12 Double Deck Vibrators
1—3'x8' Low Head Vibrator
9—Jeffrey Traylor Vibrator Feeders
5—Jeffrey Traylor Vibrator Screens
1—Magnetic Separator—Complete
1—Set Jeffrey Dewatering Screens
1—Hi Pressure Oil Spray
14—Scraper Conveyors of various sizes
32—Tipple Belts from 15" to 42" width and various lengths
5—Loading Booms with Hoists, Air Valves, Blowers, Pumps, New Screens, Parts for CMI Dryers, Speed Reducers, Feeders & Many other parts for Tipple Equipment.

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39—36" t.g. Drop Bottom Cars
233—42" t.g. End Dump Cars, Various makes and sizes
36—42" t.g., ACF, 6 Ton Drop Bottom Cars, Good as New
33—44" t.g. Drop Bottom Cars, 10 Ton
174—44" t.g. Drop Bottom Cars, various sizes
505—44" End Dump Cars, various makes and sizes
80—48" t.g. S.D. Drop Bottom Cars

RAIL AND WIRE
35—Tons 16 lb. Rail
2,800—Tons 20, 30, 56, 70 & 85 lb. Relaying Rail
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7,500'—750,000 CM Insulated Copper Feeder Wire
13,550'—500,000 CM Insulated Copper Feeder Wire
17,000'—350,000 CM Rubber Covered & Insulated Copper
80,000'—4/0 Rubber Covered & Insulated Copper
4,800'—3 Section Trolley Wire
12,000'—4/0 Trolley Wire
5,000'—4/0 Trolley Wire
56,000'—2/0 Solid Copper Trans. Line
205,500'—#2 Solid Copper Transmission Line
30—Spools New Telephone Wire

MISCELLANEOUS
1—800 h.p. Single Drum Hoist
1—300 h.p. Single Drum Hoist
1—100 h.p. Single Drum Hoist
94—Hoists, from 5 h.p. to 100 h.p.
1—800 h.p. Motor
1—500 h.p. Motor
2—300 h.p. Motors
564—Stationary Motors: ½ to 300 h.p. of various specs.
1—1200 GPM Cent. Pump
1—1000 GPM Cent. Pump
2—800 GPM Cent. Pumps
1—600 GPM Cent. Pump
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3—Joy 14-BU Loaders, low pedestal, 7AE.
2—Joy 14-BU Loaders, medium pedestal, 7BBE.
1—Joy 14-BU Loader, high pedestal, 7BE.
2—Joy 12-BU Loaders, 9E, latest type.
1—Joy 12-BU Loader, 220 volt AC.
1—Joy 20-BU Loader, latest type.
1—Joy 11-BU Loader, latest type.
2—Joy 8-BU Loaders, 250 volt DC.
1—Joy 8-BU Loader, 34" overall height.
2—Joy 8-BU Loaders, 220 volt AC.
1—Joy curved Bar Head, complete.
2—Reliance 38-J Motors, 10 H.P.
6—Reliance 24-J Motors, 7½ H.P.
4—Reliance 10-J Motors, 5 H.P.
20—9-J Motors, 4 H.P.
6—New Wheel Units for Joy 6SC Shuttle Car.
1—Goodman 660 Loader on cats, excellent.
1—Goodman 665 Loader on cats, latest type.
2—Joy 8SC Shuttle Cars, rebuilt.
2—Joy 6SC Shuttle Cars, rebuilt.
2—Joy 5SC Shuttle Cars, rebuilt.
2—Joy 32E9 Shuttle Cars.
2—Joy 32E10 Shuttle Cars, rebuilt.
2—Joy 32E15 Shuttle Cars, rebuilt.
1—Joy 32E16 Shuttle Car, rebuilt.
2—Joy 42E16 Shuttle Cars, rebuilt.
1—Joy T-2-5 low pan Cat Truck.
1—Joy T-2-6 low pan Cat Truck with reel.
2—Joy T-1 Standard Cat Trucks, 220 AC.
1—Joy T-1 Standard Cat Truck, 250 DC.
2—Joy 11-B Cutting Machines, like new.
1—Joy 7-B Cutting Machine, like new.
3—Joy CD-22 Drills, like new.
6—Goodman 512 Machines with Bugdusters.
1—Goodman Machine on Cats, 31" high. All hydraulic.
1—Goodman 512 Cutting Machine, perfect.
2—Goodman 512 cutting machines, 220 volt AC.
1—Lee Norse low vein Machine Carrier on rubber.
2—Jeffrey 70 URB's, rubber tired, Cutters, Universal head, perfect condition.
1—Joy 10RU Rubber Tired Cutter, first class.
1—Joy 11RU, rubber tired Cutter, with bugdusters, Universal head, like new.
2—Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on cats, 250 volt DC.

LOCOMOTIVES

3—Jeffrey 13 ton, type MH-110, 36", 42" and 44" Ga.
2—Jeffrey 10 ton, type MH-110, 42" and 44" Ga.
1—Jeffrey MH-124, 6 ton, 24 overall height.
12—Jeffrey, 6 ton, type MH-88, 42", 44" and 48" Ga.
2—Jeffrey, 8 ton, type MH-100, 2" armor plate frames.
1—Jeffrey, 6 ton, type 2186, 22" above rail.
3—Jeffrey, 4 ton, type MH-96, 42", 44" and 48" Ga.
1—G. E. 4 ton, type 825 Locomotive, 22" high.
10—G. E. 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" Ga.
1—G. E. 8 ton, type 822 Locomotive, 44" Ga.
3—G. E. 10 ton, type 809 Locomotive, 42", 44" and 48" Ga.
2—Goodman, type 33, 6 ton, 44" and 48" Ga.
3—Goodman, 8 ton, type 32A, 36", 44" and 48" Ga.
3—Westinghouse, type 902, 4 ton, 42" and 48" Ga.
2—Westinghouse, type 904, 6 ton, 44" and 48" Ga.
2—Westinghouse, type 906, 44" and 48" Ga.
2—Westinghouse, type 907, 10 ton, 44" and 48" Ga.
2—Diesel Locomotives, 8 and 10 tons, excellent.
8—Jeffrey MH-78 Locomotive Units, cheap.
3—Plymouth Diesel Locomotives, 8 and 10 tons, 42" and 44" Ga.
4—Jeffrey MH-88 Locomotive Units, real bargains.
6—Jeffrey MH-100 Locomotive Units, reasonable.
Locomotive Trucks and Spare Armatures for all the above.

TIPPLE EQUIPMENT

1—Cedar Rapids portable super Screening Plant.
1—Allis-Chalmers 5' x 14' Rippflo Vibrator.
1—5' x 14' Robins double deck Vibrator.
1—4' x 10' Robins Gyrex Vibrator.
1—Roberts and Schaefer tandem Hydro-Separator. Belt Loading Booms.
1—Robins Car Shakeout.
10—Crushers, various sizes.
Feeders, Drag Conveyors and Loading Booms.

CUTTING MACHINES

1—Joy 10RU, rubber tired, Cutter.
2—Jeffrey 70 URB Cutters, rubber-tired, Universal Head, low vein.
3—Jeffrey 29UC Universal Machines on Cats.
1—Joy rubber tired 11RU Cutter with bugdusters.
1—Goodman on cats, 31" overall height.
3—Baby Goodman, 212's, rebuilt, 250 volt DC.
1—Baby Goodman, 212, rebuilt, 220 volt, 3 phase, AC.
1—Goodman 312, 18" high.
6—Goodman 512's, with bugdusters, like new.
4—Goodman 512's, rebuilt, or as removed from service.
2—Joy 11B Cutting Machines, rebuilt.
2—Goodman 512 cutting machines, 220 volt AC.
6—Goodman 12AA's and 112AA's.
2—Goodman 324 Slabbers.
2—Goodman 724 Slabbers.
6—Jeffrey 35L's, like new, 17" high.
2—Jeffrey 35L's, on low vein trucks.
1—Jeffrey 35L, 220 volt AC.
15—Jeffrey 35B's and 35BB's.
2—Jeffrey 29B's on track.
2—Jeffrey 29C's, track mounted.
1—Jeffrey 29L on track, perfect.
2—Sullivan CR-10's, 15" high.

LOADING MACHINES

16—Loaders, all types.
2—Jeffrey 61 CLR's on rubber, 26".
3—Jeffrey L-500 Loaders.
2—Myers Whaley No. 3 Automat Loaders.
2—Clarkson Loaders, 26" above rail.

CONVEYORS

1—Jeffrey 52-B, 30" Conveyor, 1,000'. Excellent.
4—Joy 30" Underground Belt Conveyors, 500' to 2,000' each. Excellent.
1—Barber Greene 30" Belt Conveyor, 1,000'. Excellent.
1—Robins 30" Belt Conveyor, 1,000'.
1—Jeffrey 52-B, 26" Conveyor, 1,200' each.
3000' Conveyor Belt, 30".
2—61EW Elevating Conveyors.
2—61WH, 15" Room Conveyors, 300'.
2—Joy 15" Room Conveyors, 300'.
2—Joy 20" Conveyors, 300'.
4—Joy Ladel UN-17 Shakers.
10—Goodman G-12½ and G-15 Shakers.
3—Long 400 DBH 15" Chain Conveyors, 25 H.P., Motors, new.

CONVERTERS AND DIESEL PLANTS

1—50KW, G. E. TC-6, 275 volt, Rotary Converter.
2—100KW, G. E. TCC-6's, 275 volt, Rotary Converters.
1—150KW, G. E. HCC-6, 275 volt, Rotary Converters.
1—150KW, 6 phase, Allis-Chalmers, Rotary Converter, 275 volt DC, perfect.
1—200KW, Allis-Chalmers, Rotary Converter, 6 phase, 275 DC, perfect.
1—200KW, G. E. HCC-6 Rotary Converter, 275 volt DC.
1—300KW Portable Rectifier.
3—300KW G. E. HCC-6 Rotary Converters, 275 DC.
3—300KW Westinghouse, 6 phase Rotary Converters, 275 volt DC.
1—375KW Westinghouse Rotary Converter, 275 volt.
2—500KW Westinghouse Rotary Converters, 275 volt DC.
1—200KW Westinghouse Rotary Converter, 275 DC.
(All the above with 6900/13000 and/or 2300/4000 primary transformers)
2—150KW MG Sets, General Electric and Westinghouse.
1—200KW MG Set, Westinghouse, rebuilt.
1—200KW MG Set, General Electric, perfect.
2—150KW Allis-Chalmers MG Sets, 275 DC volt, excellent, 220-440 AC volt.
1—300KW Westinghouse, 600 volt MG Sets, rebuilt.
2—300KW Westinghouse, 600 volt, 6 phase, Rotary Converters.
4—500KW Westinghouse, 600 volt DC, 6 phase, Rotary Converters.
1—500KW, HCC-6 Rotary Converter, 6 phase, 600 volt DC.
1—Cummins 125KW Diesel with 250 volt DC generator.
1—G. M. C. Diesel Plant with 60KW Generator, 275 volt DC.
1—G. M. C. Diesel Plant with 85KW Generator, 275 volt DC.
1—D-13,000 Caterpillar Diesel with 75KW Generator, 275 volt DC.
1—Allis-Chalmers Natural Gas Engine with 100KW Generator, 275 volt DC.
1—700 H. P. Shaft hoist, complete.
Complete steam plant, will sell all or any part.
Boilers, like new, 1100 H. P., and 500 H. P. Also transformers, turbines, etc.
1—Complete Tipple with Cleaning Plant.

MISCELLANEOUS

4—All Steel Armco Buildings, various sizes.
20—Jeffrey Molveyors on rubber tires.
1—¾ Yard Shovel and Back Hoe.
1—¾ Yard Crane on Cats.
Battery Supply Tractors, rubber tired.
1—Cantrell Air Compressor on rubber tires.
10—Air Compressors, 1 H. P. to 40 H. P.
2—Joy self propelled rubber tired Compressors. 240 cu. ft.
2—Acme self propelled rubber tired Compressors. 130 cu. ft.
40—Mine Pumps, all types.
1—Differential 40 Passenger Man-Trip Car.
6—MSA Rock Dusters.
2—Phillips Carriers, 44" and 48" Ga.
2—Barber Greene self propelled Bucket Elevators.
Pipe, Plastic, Steel, Transit, all sizes 1" to 6".
45 Mine Cars, drop bottom, 42" Ga.
30 Mine Cars, drop bottom, 44" Ga.
100 Mine Cars, 18" high, end dump, 44" Ga.
100 Mine Cars, end dump and drop bottom, 20" high, 48" Ga.
1—10 ton Mine Car Scale with Recorder.
1—150 ton Railroad Track Scale.
15—Brown Fayro HKL and HG Car Spotters.
1—12 ton Differential Slate Larry.
Incline Hoist, 25 to 50 H. P.
1—Jeffrey 6' Aerodyne Fan.
1—Jeffrey 8' Aerodyne Fan.
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***Indicates more product information may be found in company advertising appearing in COAL AGE 1957 Mid-July Mining Guidebook and Buying Directory Issue. Check your Guidebook index.**

*Aeroquip Corp. 36
*Allegheny Ludlum Steel Corp. 53
*Allis-Chalmers Manufacturing Co. Industrial Equipment Div. 6
Allis-Chalmers Manufacturing Co. Construction Machinery Div. 130–131
Aluminum Co. of America 41
*ACF Industries, Inc. American Car & Foundry Co. ..... Third Cover
*American Cyanamid Co. (Explosives Div.) 63
*American Pulverizer Co. 160
*Anaconda Wire & Cable Co. 147
Ashland Oil Co. 15
*Atlas Powder Co. 51
*Austin Powder Co. 42

Bethlehem Steel Co. 14, 134, 169
Bird Machine Co. 4
Boston Woven Hose & Rubber Co. 87
Broderick & Bascom Rope Co. 65
Bucyrus Erie Co. 39, 45

Caterpillar Tractor Co. 56–57, 104–105, 182
Chevrolet Div. General Motors 60
*Chicago Pneumatic Tool Co. 155
*Cincinnati Mine Machinery Co. 173
Continental Gin Co. 164

Deister Concentrator Co. 110
*Denver Equipment Co. 46
Dorr-Oliver, Inc. 122–123
*Dravo Corp. 171
duPont de Nemours & Co., E. I. (Elastomers Div.) 149

Ensign-Bickford Co. 70
Euclid Div. General Motors Corp. 67
*Exide Industrial Div. Electric Storage Battery Co. 64

Fairbanks, Morse & Co. 121, 148
Fairmont Machinery Co. 13
Fairview Bit Co. 48
*Falk Corp. 162
Firestone Tire & Rubber Co. 167
Firth Sterling, Inc. 29
Fletcher & Co., J. H. 44
Flexible Steel Lacing Co. 58

Gates Rubber Co. 62
General Tire & Rubber Co. 10
GMC Truck & Coach Div. General Motors. 112
Goodman Manufacturing Co. 47
Goodrich Industrial Products Co., B. F. 1
Goodrich Tire Co. Div. B. F. Goodrich Co. 157
*Gundlach Machine Co., T. J. 69
Guyan Machinery Co. 170

Hamilton Rubber Co. 49
*Harnischfeger Corp. 2–3
*Hendrick Manufacturing Co. 48
Hendrix Manufacturing Co. 138
*Hewitt-Robins, Inc. 98–99
*Heyl & Patterson, Inc. 172

Jeffrey Manufacturing Co. 18–19, 145
*Joy Manufacturing Co. 24–25

Kelly Manufacturing Co. 146
*Kennametal, Inc. 35
Koehring Co. 153

Lee-Norse Co. 55
*LeRoi Div. Westinghouse Air Brake Co. 161
LeTourneau-Westinghouse Co. 91
Lima Works, Construction Equipment Div. Baldwin-Lima-Hamilton Corp. 135
*Link-Belt Co. ..... Fourth Cover, 170
*Long Co. 181
Lukens Steel Co. 43

Macwhyte Co. 27
Marietta Concrete Corp. 141
*McNally Pittsburg Manufacturing Co. 37–38, 158
*Merrick Scale Manufacturing Co. 34
Metallurgical Products Div. General Electric Co. 111
*Mine Safety Appliances Co. ..... Second Cover

*National Malleable & Steel Castings Co. 66
National Mine Service Co. 31

Ohio Brass Co. 89, 159
Okonite Co. 139

Page Engineering Co. 20–21
*Paris Manufacturing Co. 168
Pattin Manufacturing Co. 146
Post-Glover Electric Co. 166

Republic Steel Corp. 92–93
*Roberts & Schaefer Co. 52
Rockbestos Corp. 68
Roebling Sons Corp., John A. 102
*Rome Cable Co. 113

Sanford Day Iron Works, Inc. 96
Schroeder Bros. 34
Searchlight Section 174–179
Simplex Wire & Cable Co. 33
Sinclair Refining Co. 59
*Stamler Corp., W. R. 50
Sun Oil Co. 22–23

*Texas Co. 8–9
Thermoid Co. 163
Thurman Scale Co. 171
Tyler Co., W. S. 54

United States Rubber Co., Tire Div. 58
United States Rubber Co. Mechanical Goods Div. 151
*United States Steel Corp. 143, 165

*Wedge Wire Corp. 40
*Western Machinery Co. 86
Wickwire Spencer Steel Div. Colorado Fuel & Iron Corp. 61
Wilmot Engineering Co. 140

Youngstown Sheet & Tube Co. 16–17

PROFESSIONAL SERVICES 174

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 175
BUSINESS OPPORTUNITIES Offered 175
EQUIPMENT (Used or Surplus New) For Sale 175–179
WANTED Equipment 177

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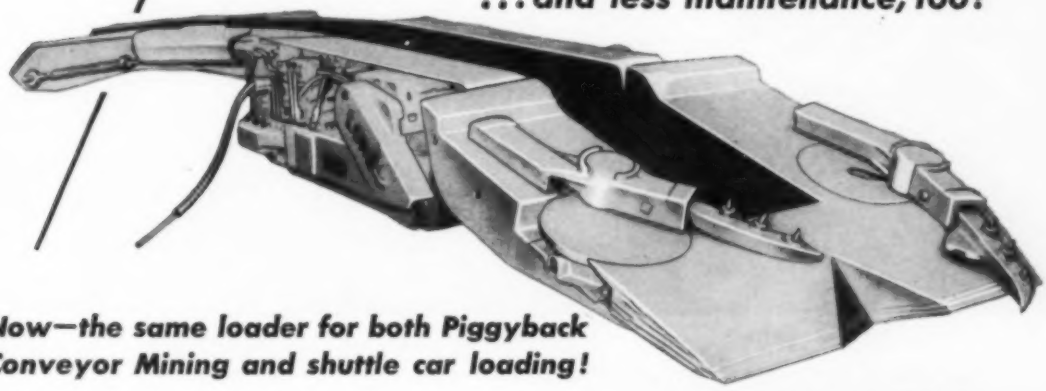
...and less maintenance, too!



Now—the same loader for both Piggyback Conveyor Mining and shuttle car loading!

With its counter-balanced head and swing boom, the LONG 188-D is specifically designed to work with Piggyback* Mining as well as with shuttle cars. The swing boom feature is an advantage in most Piggyback applications and permits greater versatility with the same loader—even permitting the use of Piggybacks and shuttle cars on the same section.

Time studies prove that the 188-D outperforms any loader for shuttle car loading. Its 25¾-inch height makes it the lowest, high capacity loader on the market. Its unique head design, with flat digging angle and recessed digging arms, permits lifting the head as much as 10 inches off the mine bottom without the strokes of the digging arm exceeding the overall height of the machine. This recessed arm feature has an important effect on actual working height, since in other designs the rear stroke of the gathering arms projects above the overall height of the machine.

In the straightforward, simplified design of the 188-D, there are only a fraction as many control and mechanical parts as in ordinary loading machines. For example, there is only one main speed reducer (instead of four) and only one motor and control. The single 40 horsepower compound wound motor, unlike smaller series wound motors, maintains speed and loading rate in toughest going.

The result—the LONG 188-D is easier to understand; operation is more efficient with less downtime and maintenance; you save on spare parts inventory; upkeep is simplified and easier to perform.

And you get all these advantages to boot!

Lower first cost • High capacity operation at lowest cost per year • Single 40 HP electric motor drives all machine operations—provides maximum digging and tramming power • All functions are controlled hydraulically from a single bank of control valves • Long wheel base and wide tracks give exceptional stability and positive operation • Lowest operating height (25¾") of any high capacity loader.

*Trade marks Reg. U.S. Pat. Office

For details or a demonstration, write . . .

Modernization on the 88 and 188 designs is simple. Any 88 or 188 in the field may be modernized to the latest 188-D design at reasonable cost.

The LONG Company
Oak Hill, W. Va.

GET HUGE DOZING CAPACITY WITH THE D9

Look at the immense rolling load in front of this CAT D9 Tractor with No. 9S Load-Shape Bulldozer! The D9 can handle up to 10 cu. yd. of this clay and sand per pass.

Here the D9 is opening a box cut and keyway at the newly opened coal strip mine of the A. W. Lotze Contracting Co. in Lawrence County, Pa. There is approximately 55 feet of overburden to be stripped off. Mr. Lotze has a D9 on this operation because "20 years of experience have proved to me that Caterpillar-built machines get the job done at lowest cost."

Particularly in an operation like stripping overburden, you're far ahead with D9 performance. In addition to its size and power (320 HP at the flywheel), the D9 is one of the easiest of all tractors to operate. Its power-boosted controls help the operator stay at top efficiency throughout his shift.

Many features contribute to economy with the D9. The exclusive Caterpillar oil clutch can operate thousands of hours without adjustment; the track rollers, with bushing-type bearings, require less service time; and there's extra protection with Caterpillar's hydraulic track adjusters because the right tension can easily be maintained on the tracks.

Available with either torque converter or direct drive, the D9 is ready to give you the most economical big-volume production you've ever experienced. Ask your Caterpillar Dealer to demonstrate this massive prime mover at your mine. And remember, you can depend on him for prompt service and quality Caterpillar parts.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR

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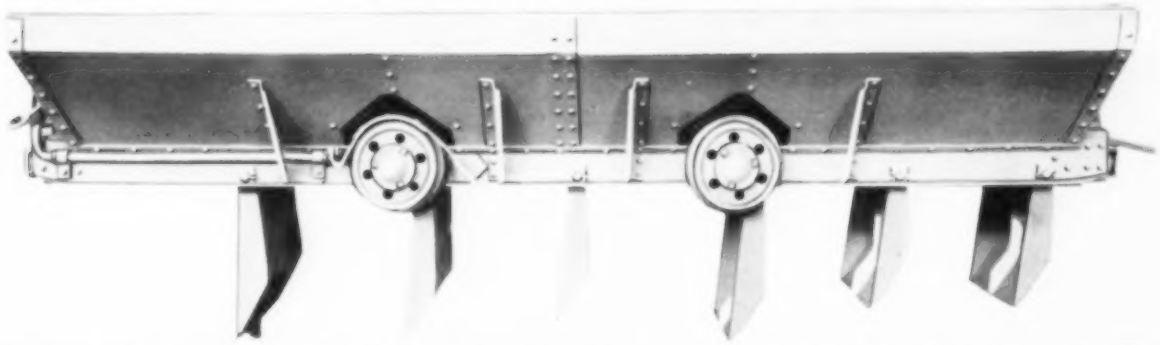
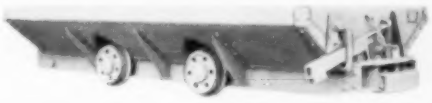
WANTED—
THE HARD WORK

only acf automatic drop bottom cars have



LUBRICATED DOORS!

- **Smoother, faster operation**
- **Minimum wear, year after year**
- **Speedy unloading with easy, positive door action**
- **Corrosion resistant hinge rods**
- **Interior fittings for greasing**



acf Automatic Drop Bottom Mine Cars are available in every capacity and type. Designed and constructed to meet specific operating needs. Welded end sill members, exclusive double action spring bumpers. Chilled Tread "Load Support" Wheels with roller bearings assure long, trouble-free service.

For complete information, contact your nearest acf sales office.

American Car and Foundry, Division of acf Industries, Incorporated, 750 Third Ave., New York 17, New York.

Sales Offices: New York–Chicago–Cleveland–Washington, D.C.–Philadelphia–San Francisco–St. Louis–Berwick, Pa.–Huntington, W. Va.

Bulletin describing all types of acf Mine Cars *available on request.*

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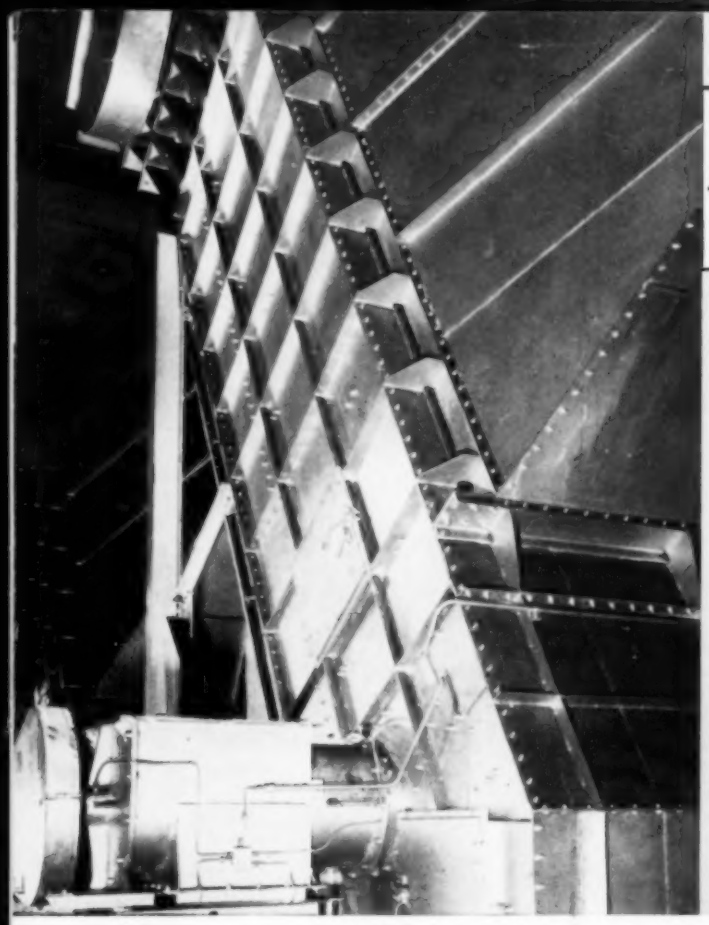
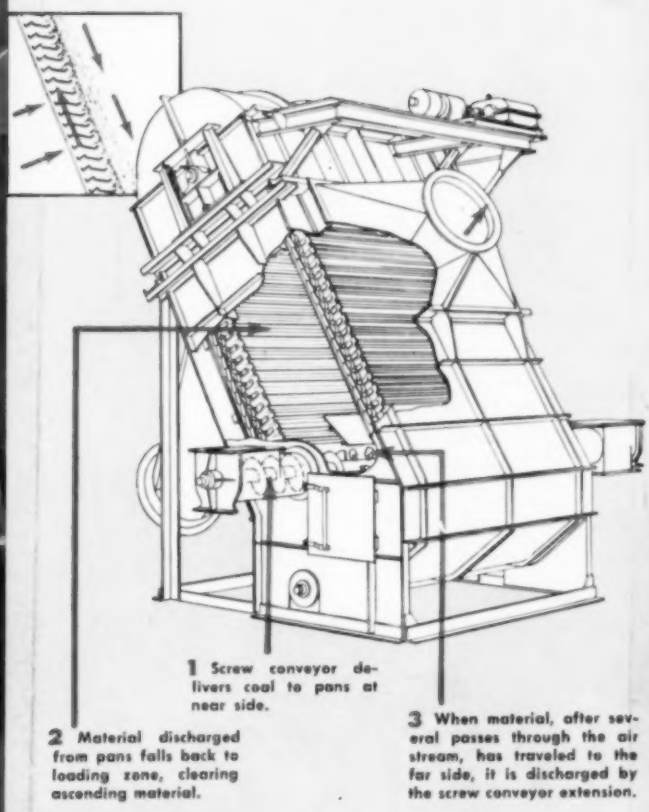
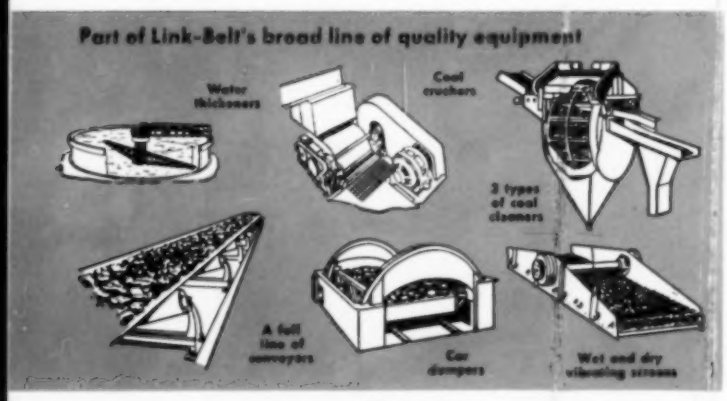
MINE CARS FOR CONSTANT HAULAGE.




1 Screw conveyor delivers coal to pans at near side.
2 Material discharged from pans falls back to loading zone, clearing ascending material.
3 When material, after several passes through the air stream, has traveled to the far side, it is discharged by the screw conveyor extension.

HERE'S HOW THE MULTI-LOUVRE WORKS—Louvre pans raise the coal and spill it out to form a constantly moving curtain, through which heated air is drawn by exhaust fans. A screw-paddle conveyor gently moves the coal to another section of the moving apron to be carried up and spilled out again. Constant agitation of shallow material bed assures thorough circulation of air and reduces power requirements to a minimum.

Why you produce more marketable coal with LINK-BELT Multi-Louvre dryers


Part of Link-Belt's broad line of quality equipment
Water thickeners
Coal crushers
2 types of coal cleaners
A full line of conveyors
Car dumpers
Wet and dry vibrating screens

Drying is uniform, gentle and safe without oxidation . . . at lower cost

If thermal drying is required in your coal preparation plant, install Link-Belt Multi-Louvre dryers and put an end to your high-moisture coal problems.

These *proved* dryers give you a more marketable coal at lower cost per ton. This is accomplished by thorough, accurate moisture reduction resulting in a uniformly high grade coal. Gentle action handles size of coal from minus 28-mesh to 1½ inches without appreciable degradation.

Oxidation is eliminated by controlled low temperatures (100 to 120 F—well below the oxidation point). High safety factor is achieved through low air velocities which reduce explosion hazards by minimizing dust in the air stream.

And these product benefits are realized at lower cost per ton. The Link-Belt Multi-Louvre dryer pays big dividends in lower maintenance costs . . . reduced power requirements . . . overall operating flexibility.

Whether it's a dryer, a conveyor or an entire plant—look to Link-Belt's complete equipment line and engineering background. For facts, call your Link-Belt office. 14.697

LINK-BELT

COAL PREPARATION AND HANDLING EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Birmingham 3, Cleveland 20, Denver 2, Detroit 4, Huntington 9, W. Va., Indianapolis 6, Kansas City 8, Mo., Louisville 2, Pittsburgh 13, Seattle 4, St. Louis 1, Scarboro (Toronto 13), Springs (South Africa).